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CONTENTS.

EDITORIALS 465
Automobile Show at Boston 468
Federal Government Institutes Test Suits Against Manufacturers of Incandescent Lamps 468
Association of Railway Electrical Engineers 468
Minnesota Electrical Convention 468
Examination for Engineer-Physicist 468
W. H. Blood, Jr. 469
Electric Discharge in a Magnetic Field 469
Presentation of Badges to Past-Presidents, American Institute of Electrical Engineers 470
The Central Station of the Canton of Schaffhausen.—By Alfred Gradenwitz 471
International Congress of the Applications of Electricity, Turin, 1911. 475
The Electric Vehicle and the Central Station 476
State Control of Water Powers in Colorado 477
Toronto Section Meeting 477
Electrical Education 477
Underground Conduit Construction in Down-Town New York.—By S. D. Levings 478
Electrical Exports for January 482
Chemical Action in High-Tension Windings 482
ELECTRICAL NOTES FROM GREAT BRITAIN 483
George A. McKinlock on International Questions 484
ELECTRICAL NOTES FROM CONTINENTAL EUROPE 485
Standardizing Electrics 486
Elements of Power-Station Design.—XXVI.—By W. B. Gump 487
Use of X-Rays to Discover Pearls 491
New Cars for South Side Elevated, Chicago 491
Electricity as an Advertising Medium.—By C. M. Axford 492
Toronto Automobile Show 493
Electric Advertising Display by Airships 494
Enlightening Eighteen Million People 494
Electric-Iron Campaign 494
Residence-Lighting Campaign 495
Value of Electrical Advertising 495
Lighting a Breakfast-Food Factory.—By Roscoe Scott 496
Organization of County Light Section at Pittsburg 497
New System of Multiplex Telegraphy 498
New Signal Installations on the Santa Fe 498
Modern Tendencies in Trunk-Line Electrification.—By C. L. De Muralt 500
Electrical Equipment of a Mexican Reduction Mill 501
Electrically Lifted Dams 502
The Industrial Safety Association 502
FINANCIAL REPORTS OF ELECTRICAL COMPANIES 503
AMONG THE CONTRACTORS AND SUPPLY MEN 503
NEW ELECTRICAL AND MECHANICAL APPARATUS AND APPLIANCES 504
ELECTRIC FANS FOR 1911 507
CURRENT ELECTRICAL NEWS 517
DIRECTORY OF ELECTRICAL AND ALLIED ENGINEERING AND SCIENTIFIC SOCIETIES 524
RECORD OF ELECTRICAL PATENTS 526

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A NEW ELECTRIC-VEHICLE CAMPAIGN.

On other pages of this issue we report a meeting which was held in Boston last week under the auspices of the Boston Edison Electric Illuminating Company. This company has inaugurated a campaign of education looking to increasing the use of electric vehicles in the 500 square miles of territory covered by its network of distribution. A considerable investment has already been made in electric vehicles, displacing horse-drawn and gasoline-engine-driven equipment. Various other large sums will be appropriated for carrying on this work along lines which will be dictated by careful analysis of the type of apparatus available and the practical requirements to be met in satisfying local conditions.

The manufacturers of electrical storage batteries and the builders of electric vehicles have for a long time been hard at work trying to interest the managers of central stations in the matter of going after the business of charging storage batteries for driving electric vehicles during the off-peak hours. It has been pointed out that this is a most desirable load and that if properly controlled so low a rate could be made that the use of the electric vehicle would be greatly stimulated, because, at once, the bugbear of high cost of operation would be removed.

The Boston Edison Company is going to try this thing out on a very comprehensive scale. The vehicles are available, the batteries are all right, and the motors will do whatever is required of them. One of the most progressive central-station managements in the world has indicated its faith in the electric vehicle. Any half-hearted support given to this by the manufacturers of electric vehicles throughout the country will contribute to their everlasting condemnation. The greatest opportunity ever opened up to the electric-vehicle manufacturers is now at hand. It is for them to take advantage of the lead made by the Boston Edison Company and get actively to work with central stations in other parts of the country so that there may be a universal acceleration of the movement rather than an apathetic waiting to see whether the local institution will pan out. The Boston program is going to be successful, because it is founded in faith, and the resources upon which it will draw will insure its success. And whatever benefit the Boston Company may derive will accrue in greater measure to the other elements in the enterprise.

ELECTRIC FANS FOR 1911.

There will be found in this issue detailed descriptions of the salient features of electric fans offered by many of the manufacturers for the season of 1911. While there have been no radical changes in electrical or mechanical construction, a comparison of this year's offerings with the fans of previous seasons will indicate refinements of design, increased ruggedness and greater flexibility.

The latter two improvements are significant, inasmuch as the use of the electric fan is becoming greatly extended and its period of service not limited to the hot summer months. In fact it has been pointed out that the fan can really serve a greater variety of useful purposes in the average room during the winter than during the summer, for the prime function of any fan is air-moving nd this is as essential to a properly heated and ventilated room as it is to the cooling effect produced in the hot weather. In connection with furnaces an electric fan will furnish the requisite draft for sections of risers not drawing well and thus provide a uniform distribution of heat. Fans are also invaluable for miscellaneous drying purposes, in the home, during any season. In stores the annoying coating of frost on show windows can be eliminated by warming the pane by means of an electric fan. In assembly halls, theaters, etc., the fan is a very valuable feature of the ventilating system as is the case also in large kitchens, foundries, and other heat-generating work-rooms. These are just a few of the many uses of the electric fan.

The manufacturers, anticipating the increased and varied service to which the fan is being applied, have made adequate provision in the designs for 1911, and it is therefore incumbent upon central stations in the coming fan campaign to impress their customers with the all-year value of the fan and thus, incidentally, stimulate current consumption.

INDIVIDUAL MOTOR DRIVES FOR SILK MACHINERY.

A conspicuous development in the textile field within the past few years is the application of the individual electric drive to the machinery of the silk industry. While in some respects the use of electric power in this branch of textile work presents similar problems to motor applications in cotton and woolen mills, the extremely valuable nature of the material in process in silk mills renders electric driving relatively more efficient than in the more familiar textile services. On account of the large investment in stock passing through the mill, it is of supreme importance to force production to the top notch of speed; to keep the preparatory machinery as fully occupied as possible, and above all, to secure the maximum rate of production from the silk looms. The weaving machinery is the dividend-earning portion of a silk plant, and the benefits of placing the motor directly on the loom are striking. The importance of avoiding damage to the goods from oil and dirt is so great that even if the individual motor drive did not increase the rate of production from five to ten per cent, it would be desirable to install it on account of the insurance it affords against injury to the material from foreign matter thrown off from belts and shafting.

The steadiness of speed resulting from the individual loom drive results in the practical elimination of broken warp ends and broken picker sticks, with the substantial decreasing of weaves of second quality. Tests recently made in a mechanical weave shop showed one per cent variation in the shaft speed at the end nearest the motive power and six per cent variation at the other end of the shafting, 300 feet away. This was due to the torsion stress transmitted by uneven loads through the belts, which results in irregularities leading to broken threads and imperfect production. Electric driving obviates these troubles and gives approximately constant speed at the individual loom. The direct application of power and the proper balancing of the work result in greater production for a given consumption of power, which, however, is less important than the acceleration of the manufacturing rate with a given investment in equipment and raw material. Group driving of looms by electrical methods is only a partial solution of the problem. It is often acceptably used in changing over old mills from mechanical to electrical drive for the reason that the transition is more easily made in this way, and generally at less expense. Group driving does away with many belts from the main lines of shafting, reduces the friction losses, subdivides the driving power into sections independent of one another, limits the effect of trouble to any one section, and increases the production above what is possible with a purely mechanical drive. Placing the motors directly on the looms, however, raises the production rate to the highest point consistent with the design of the machinery and the quality of goods being woven. With gear or silent-chain driving no slip occurs, whereas, even with the few belts needed in a group installation, there is some opportunity for sags in speed and irregularities due to shafting or pulleys getting out of line.

Motors used on the individual driving of silk looms are specially designed for such service, and it is especially important to have sufficient capacity to start the loom quickly, with a sharp, clean pick, throwing the shuttle full across the loom and also forcing the filling thread back against the weave so that no marks will occur in the cloth. A slip gear or friction clutch is provided in the drive, so that the motor will be disconnected from the loom and usually from the power circuit as well, in case the loom shuttle fails to get into the box. This is a very important point to present to the silk manufacturer, since frequently textile men, not realizing that the motor is readily arranged for automatic disconnection from the loom the instant the latter stops, have expressed the opinion that the direct gearing of the motor means a too rigid construction. The normal operation of a

silk loom often means twenty-five or thirty stops per hour for changing the shuttle, and with the individual drive it is possible to utilize the momentum of the motor and gear in making a quick start, since the time required for changing the shuttle is seldom much over five seconds, and although the power is cut off from the motor the instant the loom mechanism comes to rest, the speed of the motor and gear may not fall below fifty per cent of normal. The saving in time is material in the course of a year in a large factory. The nominal speed of the loom run by a direct-connected motor may remain the same as in the mechanical drive, but the actual speed is constant within one per cent in most cases where separate motors are provided, compared with variations of five or ten per cent by actual test in the speed of belt-driven looms.

The power requirements of silk looms at present are about one-half horsepower, with the use of a three-fourths-horsepower motor on most box looms, and a motor of one horsepower on velvet and plush looms. The power requirements of ribbon looms, taking narrower stock, are usually met by a one-fourth to one-half-horsepower motor, while for elastic-loom work a three-fourths-horsepower installation is common. Warping machines take from one-fourth horsepower when warping, to a maximum of 1.25 horsepower when beaming, for less than 20,000 ends; and where 30,000 or 40,000 ends are involved, a 1.5-horsepower motor gives much better service. The business is desirable from the central-station point of view, since in a good-sized plant the load is sustained over long periods, with many machines concerned. The warping process alone requires from four to six days. High-speed motors are preferable for most silk-machinery service, on account of their improved efficiency and better power-factor. The induction motor has become practically standard for such work on account of its constant-speed characteristics and its great simplicity of design and operating reliability. Not the least advantage of the individual drive for silk plants is the ease with which it may be installed in sections, enabling the manufacturer to test the actual benefits of the method on a comparatively small initial investment.

THE ARCHITECTURE OF POWER PLANTS.

The architecture of most central stations and other power plants in this country, if they may be said to have any architecture, is of a purely utilitarian style. Most structures of this kind are erected without regard to beauty or harmonious relation to their surroundings, but with a purely engineering idea of providing the equipment with an inclosing wall and a roof. The result is that many buildings of this character are an eyesore to their respective neighborhoods, whereas a slight consideration in advance of the external appearance of the building might with very little expense add greatly to the general effect. In Europe a great many of the power stations, like theaters and other public-utility buildings, are built and controlled by the government, with the result that they serve not only for utilitarian purposes but as objects of architectural beauty.

An excellent example of this is shown on page 471 of this issue, where the transformer station at Neuhausen is illustrated. This structure differs from the usual station in this country by being combined with the residence of the operator, but it cannot be claimed that this is the only reason for considering the external appearance of the structure, since it is general in European governmental undertakings, as in this country, to erect buildings which will be a credit to the community. While it is seldom that the surroundings can be controlled as is the case in this instance, nevertheless the building itself could often be made an attractive one instead of a hideous one. In this case the tower forms a very convenient point for bringing in the high-tension lines and the protective apparatus and switchgear are located here. The transformers and other station apparatus are located on the floor below and the low-tension lines come out at the lower level. The tower not only serves to add to the appearance of the structure, but is also well suited to utilitarian purposes.

There are some central-station companies in this country who employ architects when erecting new quarters, and consequently secure some attention to the appearance of their buildings, but this must be regarded as an exception rather than a rule. A little more attention to architecture, breaking up the hard, straight outlines which are found in most buildings of this character, might add sufficiently to their appearance to make them a credit and an attraction in the local community. If to this could be added the elimination of smoke, the power station might be generally considered as adding to, rather than detracting from, the desirability of its neighborhood, not only for business but even for residence purposes. It would be well for central-station companies to bear these considerations in mind.

THE INTERNATIONAL CONGRESS AT TURIN.

In connection with the International Exposition of Industry and Labor which is to be held at Turin during the coming summer, there is to be an International Congress of the Applications of Electricity, whose sessions are to be held from September 9 to 20. Addresses covering all the more important topics in this field will be delivered by invitation by men prominent in the industry. There will, however, be opportunity for the presentation of other papers by those who have matter of value to offer, and all American electrical engineers who can do so should attend, and in any case become members of the Congress. The printed transactions will form a valuable addition to the literature of the subject, and chronicle the state of the art at the present time. An announcement regarding the Congress will be found upon another page.

Automobile Show at Boston.

The Boston Automobile Show threw open its doors to the public on Saturday evening, March 4. The Mechanics Building and Horticultural Hall were thrown together, and every foot of space was occupied.

Electric vehicles and electric trucks made an excellent showing, and space was taken by the Waverly Electric, Detroit Electric, General Vehicle Company, Studebaker Brothers Company, and others. The General Vehicle Company showed a number of its latest models of electric trucks and delivery wagons, which received a great deal of attention from all visitors interested in the commercial use of electric vehicles.

The new victoria-phaeton exhibited by the Studebaker Brothers Company attracted much favorable comment. It is about the latest word in electric pleasure vehicles, and is beautifully upholstered and strongly built. It has a seating capacity of four, which, combined with its low price, is destined to make it one of the most popular products of this long established house.

The Electric Storage Battery Company, of Philadelphia; National Carbon Company, of Cleveland; Joseph Dixon Crucible Company, of Jersey City; and C. F. Splitdorf, of New York, also had headquarters at the show and exhibited their various products.

Federal Government Institutes Test Suits Against Manufacturers of Incandescent Lamps.

Announcement is made that the Federal Department of Justice has filed suit against thirty-five companies engaged in the manufacture of incandescent electric lamps. The General Electric Company, of Schenectady, the National Electric Lamp Company, of Cleveland, and the Westinghouse Lamp Company are named as the principal defendants in a suit which was filed at Cleveland, O., on March 3.

It is understood that the case is more or less in the nature of a test case, the courts to be called upon to decide whether the laws under which the companies are enjoying a patent monopoly will hold good.

It is known that the lamp manufacturers have for a long time been preparing to meet this issue with the Government and it is expected that a basis for a prompt adjustment will be made without prolonged litigation.

The companies named as defendants in the suit filed at Cleveland are General Electric Company of New York, Westinghouse Electric & Manufacturing Company of Pennsylvania, Westinghouse Lamp Company of Pennsylvania, National Electric Lamp Company of New Jersey, Aetna Electric Company of New York, the American Electric Lamp Company of New York, the Banner Electric Company of Ohio, the Brilliant Electric Company of Ohio, the Bryan-Marsh Company of New York, the Buckeye Electric Company of Ohio, the Capital-Electric Company of Colorado, the Colonial Electric Company of Ohio, the Columbia Incandescent Lamp Company of Missouri, the Economy Electric Company of Ohio, the Fostoria Incandescent Lamp Company of West Virginia, the Franklin Electric Manufacturing Company of Connecticut, the General Incandescent Lamp Company of Ohio, the Independent Incandescent Lamp Company of Missouri, the Kentucky Electrical Company of Kentucky, the Liberty Electric Manufacturing Company of Pennsylvania, the Munder Electric Company of Maine, the New York and Ohio Company of West Virginia, the Shelby Electric Company of Ohio, the Standard Electrical Manufacturing Company of Ohio, the Sterling Electrical Manufacturing Company of Ohio, the Sunbeam Incandescent Lamp Company of New Jersey, the Warren Electric and Specialty Company of Ohio, Howard Gilmore and William Gilmore of Boston, trading as the Gilmore Electric Company of Massachusetts, the York Electric and Machine Company, Elmer F. Dwyer of Lynn, Mass., trading as the Dwyer Machine Company, the Corning Glass Works of New York, the Fostoria Bulb and Bottle Company of Ohio, the Libbey Glass Company of Ohio, the Phoenix Glass Company of West Virginia, and the Providence Gas Burner Company of Rhode Island.

Association of Railway Electrical Engineers.

The next convention of the Association of Railway Electrical Engineers will be held at the La Salle Hotel, Chicago, November 6-10. Arrangements are being made for a comprehensive and interesting programme, and there will be an exposition of railway electrical apparatus occupying the entire top floor of the hotel.

Minnesota Electrical Convention.

The fourth annual convention of the Minnesota Electrical Association will be held at the St. Paul Hotel, St. Paul, March 14, 15, and 16. The entertainment features include a vaudeville entertainment and lunch at the New Norden Club on Wednesday evening, and a sight-seeing trip in the afternoon. An inspection trip will be made to electrical plants and through the sandrock tunnel of the St. Paul Gas Light Company, sixty feet below the business district of the city.

A preliminary program of papers to be read at the meeting was given in our issue of February 25. The following have since been added: "Window and Sign Lighting" by T. R. Willmerscheid of the Western Display Company; "Sales Departments for Cities up to 5,000," by Samuel Kahn of Fargo, N. D.; "Insurance," by R. Daniels; "Day Load for Central Stations," by E. Street, of the Northern Heating & Electric Company, St. Paul. Prof. George D. Shepardson of the University of Minnesota, will deliver a lecture upon "The Elementary Theory of Alternating-Current Motors," with demonstrations.

Arrangements are being made to entertain 300 delegates, and everything points to a very successful convention. The sessions will be held in the sun parlor of the roof garden at the St. Paul Hotel.

Joint Meeting by Telephone.

Through the courtesy of the American Telephone & Telegraph Company the Ad Clubs of Buffalo and Rochester, N. Y., on February 25 held a joint meeting by telephone, the actual meetings being held simultaneously in their respective cities. Each member of the two clubs was provided with a telephone so he could hear all that was said at the meeting at the other end of the line.

Examination for Engineer-Physicist.

On March 31 the United States Civil Service Commission will hold an examination to secure eligibles for the position of engineer-physicist and associate engineer-physicist in the Bureau of Standards, Washington, D. C. Those interested should apply to the Civil Service Commission or the secretary of any board of examiners for examination Form 1312.

W. H. Blood, Jr.

Quite a few years ago several enterprising carriage makers placed on the streets of two or three of our larger cities a few types of horseless vehicles propelled by electric motors, taking energy from storage batteries. This was before the time of the high-powered, beautifully constructed gasoline car, possibly the only rival being at that time the well-known Daimler motor. A great future was predicted for the electric vehicle and, in fact, a great many horseless carriages of this type were sold. Owing to transmission troubles, battery difficulties, and the fact that the horseless vehicle was regarded then more or less as a fad and was not backed up by heavy advertising campaigns and consequent development, the demand rather died away, and the electric-carriage business was in a quiescent state for some time.

Within the last two or three years there has been a renascence of the electric vehicle. It may be said to the credit of the manufacturers of electric vehicles that they have done a great work in developing the beautiful models that are now available, and in carrying on the extensive campaigns in popular magazines. But without doubt the greatest credit belongs to those manufacturers of storage batteries who have had courage to expend large amounts of money in interesting the central station in the electric vehicle and who have had the faith in their product that has moved the mountain of apathy and skepticism and brought around a new demand for this matchless vehicle, a demand, by the way, which is being permanized through the intelligent efforts now being directed toward increasing the public interest in the electric carriage.

On other pages of this issue a report is presented of the remarkable meeting conducted by the Edison Illuminating Company of Boston, when the announcement was made of the inauguration of an extraordinary campaign of education looking to the more general introduction of the electric vehicle. Initiated under such auspices, the movement has already gained great headway and among the strong auxiliaries which are called upon to support the movement is the Electric Vehicle Association of America. This organization is supported by the operating managers of the leading electric vehicle manufacturers, central-station men, and manufacturers of electric storage batteries. The president of the organization is W. H. Blood, Jr., whose portrait adorns this page.

W. H. BLOOD, JR.,
President Electric Vehicle Association of America.

Mr. Blood is a native of Boston, Mass., and was born about forty-five years ago. He was educated in the schools of Newton, Mass., and later took up a course in electrical engineering in Massachusetts Institute of Technology, from which he graduated in 1888. He then entered the Lynn Works of the Thomson-Houston Electric Company, later on going to the old Northwest Thomson-Houston Company in St. Paul, Minn. After that he was for six years in the contracting business in Kansas City, erecting lighting, railway and water works plants. Since 1897 he has been connected with the Stone & Webster Corporation. In 1905, Mr. Blood was elected president of the National Electric Light Association. He was then connected with the Seattle Electric Company, which carried on all of the electric lighting, power and street railway business of Seattle, Wash. This company, as is well known, is a Stone & Webster organization.

Mr. Blood has had a unique experience as a central-station man, and has been identified with a number of very important enterprises. In Seattle he was actively associated with the Puyallup River power development, transmitting 40,000 horsepower some fifty-five miles at 50,000 volts. Mr. Blood has also served the National Electric Light Association as insurance expert and in other capacities. He is an aggressive, talented engineer, and is a commanding figure at all important convocations having to do with the development of the electrical markets. The initiation of the Boston campaign is one of the most interesting developments which it has been our privilege to chronicle, and the strong and resourceful elements that have been gathered to its support insures its success.

Electric Discharge in a Magnetic Field.

The influence of a magnetic field upon the discharge in a rarified gas has been the object of a number of interesting researches.

At a recent meeting of the French Physical Society, Eugene Bloch described some experiments showing that there is an optimum strength of magnetic field. For fields weaker than this, the discharge potential is lowered, as found by Gouy, while for stronger fields the discharge passes less easily than with no field. The magnetic field was parallel to the axis of a cylinder, and the electric field is cylindrical. The two cathodes are in the axis of the cylinder, while the anode is a tube.

Presentation of Badges to Past-Presidents, American Institute of Electrical Engineers.

The distinguishing feature of the reception and dance held by the American Institute of Electrical Engineers at the Hotel Astor, New York City, February 28, was the presentation of badges to the past-presidents of the Institute.

At eleven o'clock President Dugald C. Jackson and Past-President T. Commerford Martin (1887-8), Past-President Frank J. Sprague (1888-9), Past-President Louis Duncan (1895-6-7), Past-President Carl Hering (1900-1), Past-President Charles P. Steinmetz (1901-2), Past-President Bion J. Arnold (1903-4), Past-President John W. Lieb, Jr. (1904-5), Past-President Schuyler S. Wheeler (1905-6), Past-President Samuel Sheldon (1906-7), Past-President Henry Gordon Scott (1907-8), and Past-President Lewis Buckley Stillwell (1909-10), assembled in the west gallery. The ladies and gentlemen composing the company at the reception assembled on the floor of the Ball Room.

President Jackson said in part:

It has become my honorable duty to make a speech in presentation of the badges which have been prepared by this Institute to signalize our pride, honor and satisfaction in the personality and accomplishments of our past-presidents.

This occasion is one for the highest enthusiasm. It reflects our interest and satisfaction in the active past of the Institute, the golden value of its present founded on that past, and the promise of its potent future.

Founded in 1884, only twenty-seven years ago, its 7,000 members compose the largest and one of the most influential of our national engineering societies. Its influence on the professional feeling and status of electrical engineers has been incalculable.

There remain twenty-five members who signed the original papers organizing the Institute. These include such names of world distinction as Alexander Graham Bell, Charles F. Brush, Thomas A. Edison, Elihu Thomson, Edward Weston, Theodore N. Vail, besides many others intimately known to us—Clarke, Gross, Field, Hamilton, Houston, Lockwood, Mailloux, Sperry and others. We are indebted to Dr. Nahtnaiel S. Keith, ably seconded by Mr. T. C. Martin, for the acts leading to the organization. Dr. Keith became the first secretary of the Institute. Mr. Martin, whom you will hear from later in the evening, became its third president. It was during his administration that I was admitted to its then small and youthful but enthusiastic membership.

To the men who have been our presidents we owe much in the development of this society, and this is especially true of the far-seeing early ones who laid our foundation stones.

I will also here pay a deserved tribute to the man who became our secretary in the third year of the Institute, and is completing his twenty-fifth consecutive year in that office. For the purpose of placing him in that life position which sentiment warrants, and also to add to the executive strength at headquarters, the Board of Directors has recently approved a series of amendments to the Constitution which will at an early date be forwarded to you for your consideration, and we hope may receive your favorable votes. We will then be able to establish him in the salaried post of Honorary Secretary for life.

Our first two presidents were of eminent telegraphic attainments in executive and scientific branches. These were followed by leaders in technical journalism, commercial electrical measurements, electric lighting, electric transmission of power, telephony, and electric railways, discoverers of electromagnetic laws, inventors, administrators and teachers. In the earlier years of the Institute the term of office was sometimes extended to more than one year, and twenty-two men have been presidents.

Beginning with Mr. Norvin Green, whose able hand guided the Western Union Telegraph Company, we then had Franklin A. Pope, of telegraph fame, and also a leader in electrical journalism. Then came Mr. T. C. Martin, technical journalist, chronicler of electrical history and electrical advancement; Dr. Edward Weston, electrician, chemist, and father of our modern commercial electrical measurements; Prof. Elihu Thomson, distinguished inventor, to whose charming spirit we may always look for inspiration, and by conferring on whom the first Edison medal for distinguished achievement in electricity the Institute last year delighted and honored itself; Prof. Wm. A. Anthony, that trusty, graphical teacher of electrical engineering, whose usefulness is hard to match; Dr. Alexander Graham Bell, whose invention of the telephone has brought revolution into the ways of business and social life; Mr. Frank J. Sprague, fertile inventor of exhaustless energy which, brought to bear on transportation problems, brought electric tramways to a commercial stage and with the multiple-unit control made practicable the operation of rapid-transit subways; Prof. Edwin J. Houston, whose name vies with Thomson's in association with the early remarkable Thomson-Houston electrical developments.

The foregoing administrations covered the first ten years of the life of the Institute, and carried it into 1894. Where can be discovered a more distinguished succession in electrical engineering! Truly, in our early years we honored ourselves when we exercised our right of Institute suffrage.

In our second decade we have had Duncan, then a brilliant teacher, now a consulting engineer; Crocker, teacher and longtime head of electrical engineering developments at Columbia University; Kennelly, brilliant teacher, lecturer and writer; Hering, of many accomplishments; Steinmetz, whom we delight to honor as discoverer of electric laws, scientist, inventor and teacher; Scott, engineer, inventor, and born teacher; Arnold, engineer, and reformer of city traction systems. Plainly, we exercised our suffrage with discrimination during our second decade; and the growth of the Institute in membership and in influence proves that distinguished presidents may also be efficient administrators.

Our third decade is yet uncompleted, but it is well begun. Here we have J. W. Lieb, Jr., distinguished engineer, competent executive and charming man; Schuyler Wheeler, man of many sides, to whom the Institute is indebted for an interesting part of its library; Samuel Sheldon, teacher, scientist, and expert in many directions; Henry G. Stott, of great power-station fame; L. A. Ferguson, notable for his services to perhaps the greatest electric lighting organization in the world; and Lewis B. Stillwell, consulting engineer, my immediate predecessor, the gratification of whose presence we still enjoy in our governing board.

Friends, these men have not only lent dignity and distinction of name to our Institute, but they have brought the influence of superior intellects sustained by altruistic motives. I cannot enumerate all the strong features impressed by these men on the policy of the Institute, but I may mention the large influence which has flowed from the Section organization and the student enrollment introduced by President Scott, and which is likely to flow from the mid-year semi-local conventions introduced by President Stillwell. Obviously, our membership must thoughtfully exercise their privileges of suffrage, if they are to continue to exalt into the president's office only those men of distinction and ability who accompany those important qualities with the transcendant quality of altruistic interest in the advancement of the Institute and its usefulness to the profession, separated from self-interest. Only such men can successfully maintain and extend the scope of the important activities founded by the former administrations.

It is equally needful to guard the traditions of the presidency, because of the importance of the professional spirit in electrical engineering. This spirit can only be stimulated and fostered under the leadership of men with high professional ideals and altruistic motives. The Institute should ever remain our most important agent in maintaining a high professional level in electrical engineering, and it is incumbent on us as individual members to see that each succeeding administration performs its proper share in this important function.

We have reason, fellow members, to look upon our past-presidents with honor and affection, and I find it, therefore, a peculiar honor and pleasure that the Board of Directors has directed me to confer badges of office which are to distinguish the services of the former administrations.

The Institute has heretofore chosen two badges of artistic merit for its membership; a badge of red and gold for Associates, and a badge of blue and gold for members. These are of like design but differing in color. The past-presidents' badges adopted this year, and now conferred upon our living past-presidents, are of the same design, a little smaller in dimensions, and white and gold in color.

President Jackson then presented the badges to each past-president present.

Past-President Martin responded in part as follows:

It is a great pleasure to the past-presidents of the Institute tonight, who have already enjoyed at your hands the highest honor that it can bestow, to receive this added and highly appreciated distinction.

We have given, and can give, little in return for the honors that have been bestowed upon us, but I think it can be said with all due modesty that in our efforts may be found to lie some of the elements which have gone to the upbuilding of our beloved and distinguished society, elements of principle, of ideals and of methods.

I regretted deeply, Mr. President, as you ran over the list of Past Presidents, that there are several absent from our ranks tonight, particularly those who, having escaped all physical limitation, perchance have been able to penetrate, as we have never been able to do, the deep mystery of the phenomena of the sciences, and yet, on the other hand, we are fortunate in having with us Dr. Keith, who breathed the breath of life into this Institute, and, our worthy secretary, Mr. Ralph W. Pope, who from the beginning has been our friend and mentor, and who today is just as ready to greet and inform our successors, and to transmit to them the accumulated sacred traditions of our office.

The Central Station of the Canton of Schaffhausen.

Description of a Swiss Transforming and Distributing Station.

BY ALFRED GRADENWITZ.

Whereas the electricity supply in practically all the urban communities of Switzerland has long been in communal hands, rural communities until quite recently had to rely for the purchase of electrical energy, on private undertakings. However, there has been for some years an increasing tendency to entrust the local government of each canton with the electricity supply to all the rural communities situated within its confines.

The canton of Schaffhausen has been one of the first to carry this principle into practice by concluding with the Betznau-Löntsch Works, an agreement in accordance with which the canton derives its energy in the form of three-phase alternating current at fifty cycles and 25,000 volts, to be transformed and distributed by the canton's own station.

The incoming energy is reduced to 10,000 volts at the Neuhausen main transformer station, feeding at that voltage the primary distribution system and the secondary transformer stations. The tension of 10,000 volts was chosen with a view to allow of a direct distribution in the district concerned without any excessive losses in transmission.

The main transformer station was erected on a hill near Neuhausen and is of a remarkably pleasing appearance. The entrance tower serves to house all the apparatus required for controlling the incoming line. The main part of the building contains the transformers as well as the switchgear for the transformers and the 10,000-volt lines, an induction regulator plant and a repair shop. Adjoining the tower and main building is a dwelling house for the chief operator and his assistant.

As the Betznau-Löntsch Company is likely eventually to supply current at 45,000 volts, the high-tension switchgear was from the outset equipped with apparatus for 45,000 volts. Moreover, the Neuhausen transformer station is designed for being readily connected up to any cantonal power house.

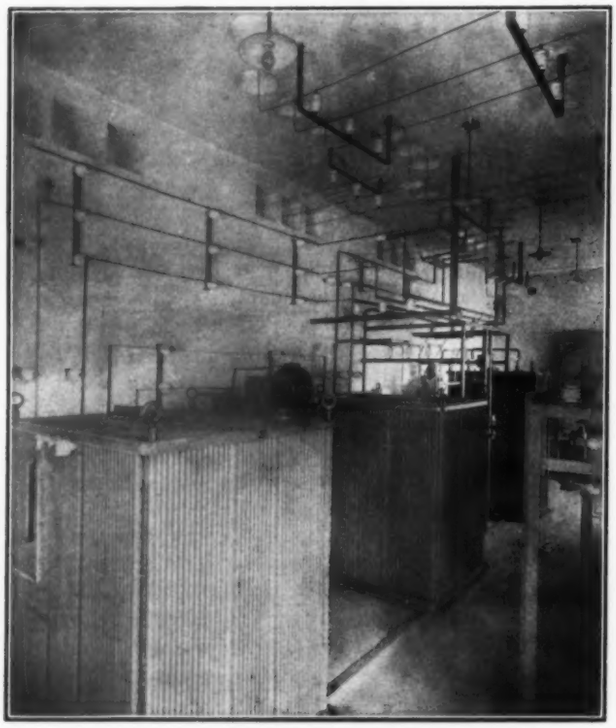
The uppermost story of the tower contains the horn-shaped lightning arresters and water resistances. A mixture of water and alcohol was used to fill the liquid resistances so as to provide against any risk of freezing. In order to allow the lightning arresters and resistances to be superintended even during operation, mechanically operated section switches have been provided.

From the upper story, the line is led through a self-induction coil for each pole and four current transformers connected to the meters, to the main

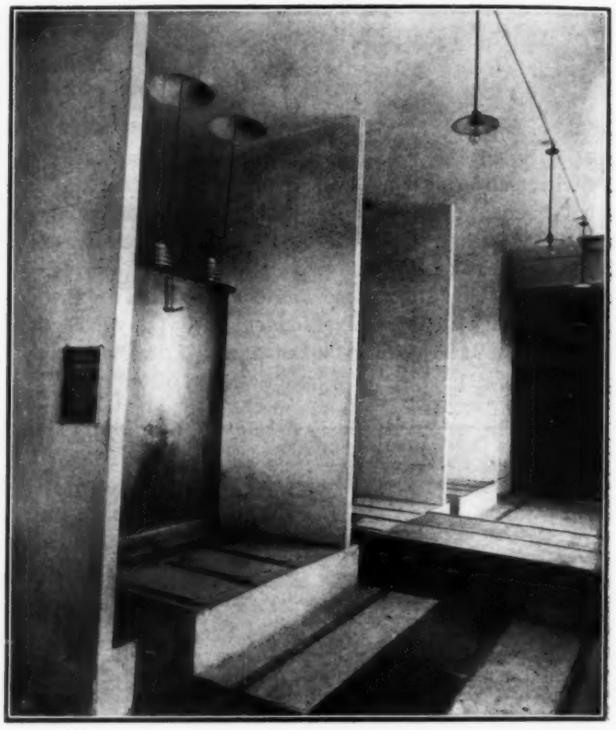
TRANSFORMER STATION AT NEUHAUSEN.

line switch located on the second floor and thence to the busbars. Section switches allow the current transformers to be cut out and short-circuited during operation. The drive of the main switch is located on the second floor in the main buildings, together with all the levers for operating the transformers and line switches. The entire station can thus be switched off from this central controlling room.

On the first floor of the tower are installed three-phase voltage transformers (one of which is a spare) for the measuring instruments. A water-jet apparatus connected to the incoming line in the basement of the tower protects against excess voltage. The incoming energy is measured by two watt-hour meters located on a switchboard in the basement of the building.



INDUCTION REGULATOR.



TRANSFORMER HOUSING.

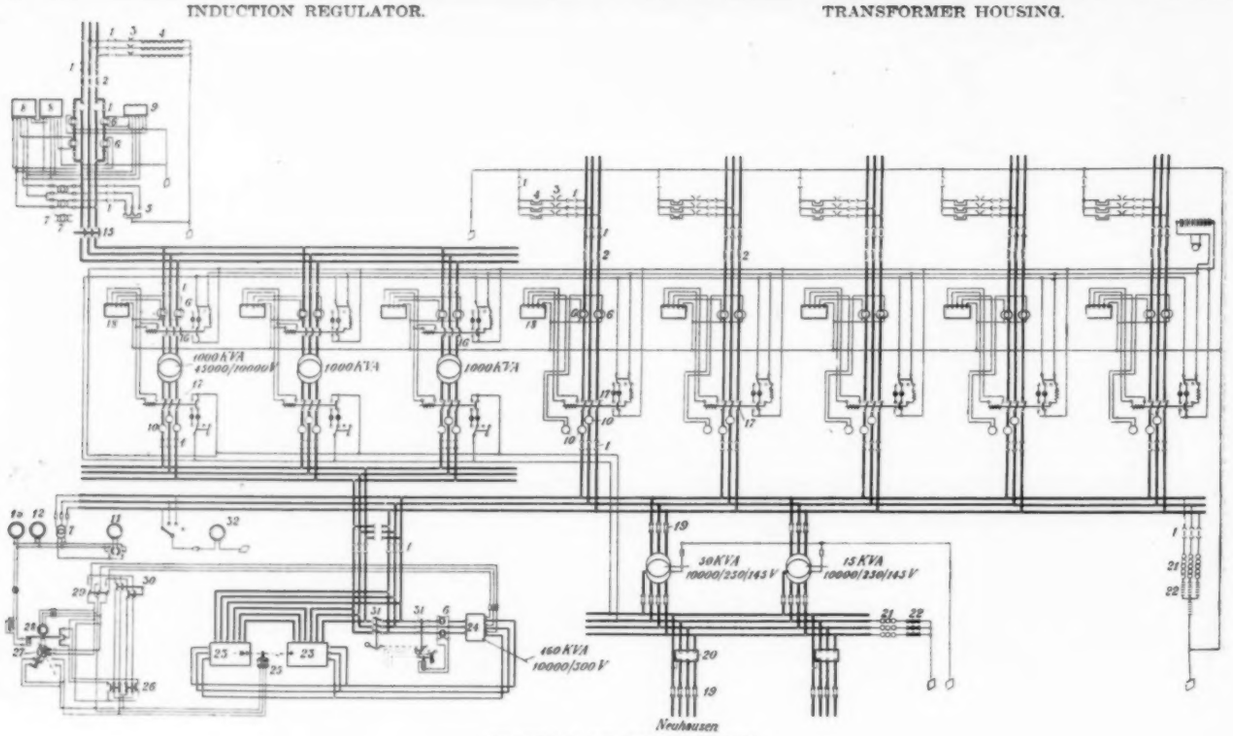


DIAGRAM OF CONNECTIONS.

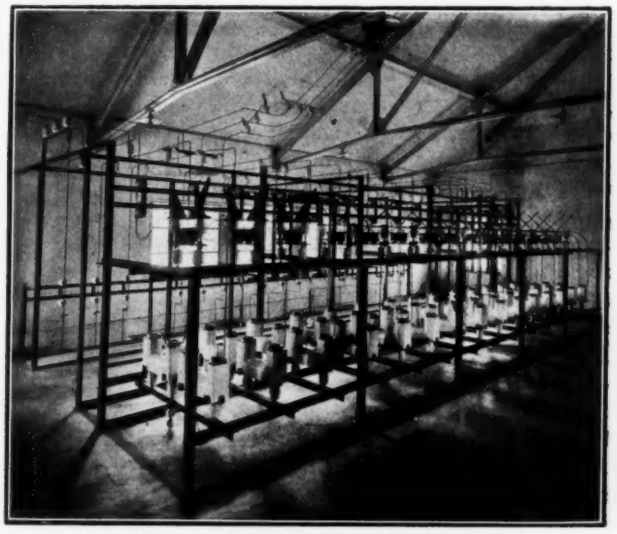
The transformer plant at present comprises two transformers of 1,000 kilovolt-amperes each, oil-immersed

with water cooling, which are designed for a ratio of 25,000 to 10,000 volts; a third unit of the same capacity is shortly to be installed. By arranging the primary coils in star connection, the transition to a working tension of 45,000 volts is readily effected.

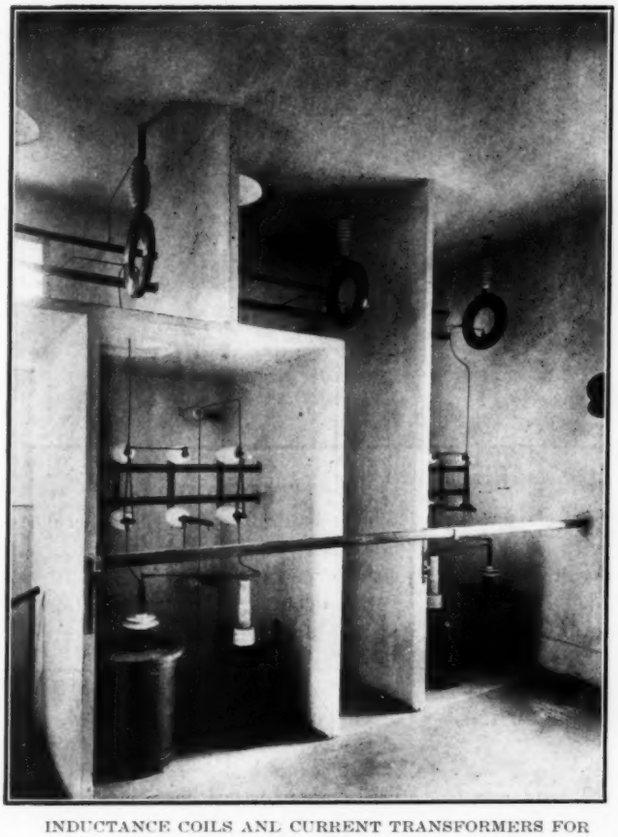
The transformers have in series with the primary and secondary windings automatic oil switches released by maximum time-relays. The releases of the two switches are coupled together electrically, thus allowing the automatic cutout to be always effected simultaneously in the primary and secondary coils. The high-tension transformer switches are located in masonry cells, the individual poles being separated by reinforced partitions (which arrangement has been adopted throughout the 45,000-volt switchgear). In the 10,000-volt part of the switchgear, all of the apparatus is mounted upon insulated iron frames.

The water for cooling the transformers and for feeding the water-jet apparatus is derived from the Neuhausen water works, the reservoir of which is located at a level only slightly higher than that of the transformer

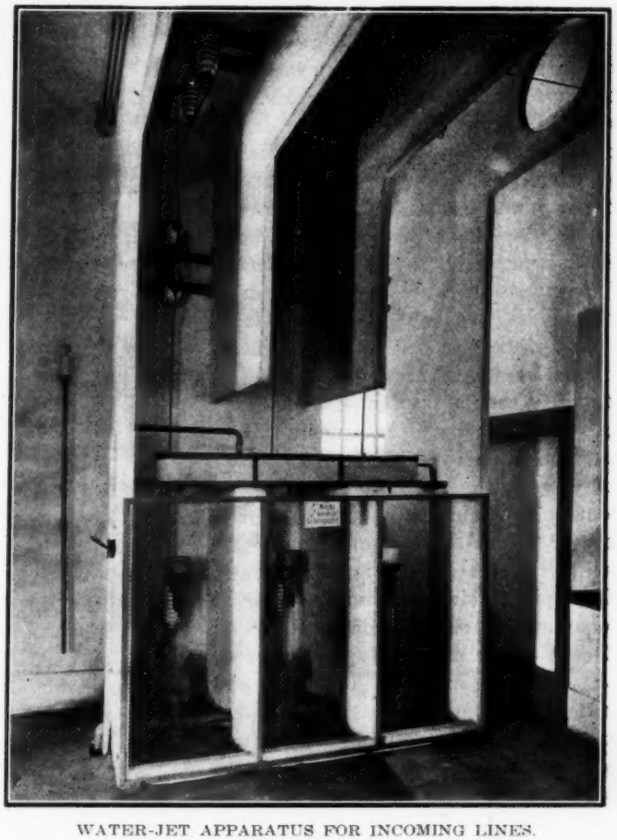
45,000-VOLT TRANSFORMER SWITCHES.



LIGHTNING ARRESTERS FOR OUTGOING LINES.



INDUCTANCE COILS ANL CURRENT TRANSFORMERS FOR INCOMING LINES.

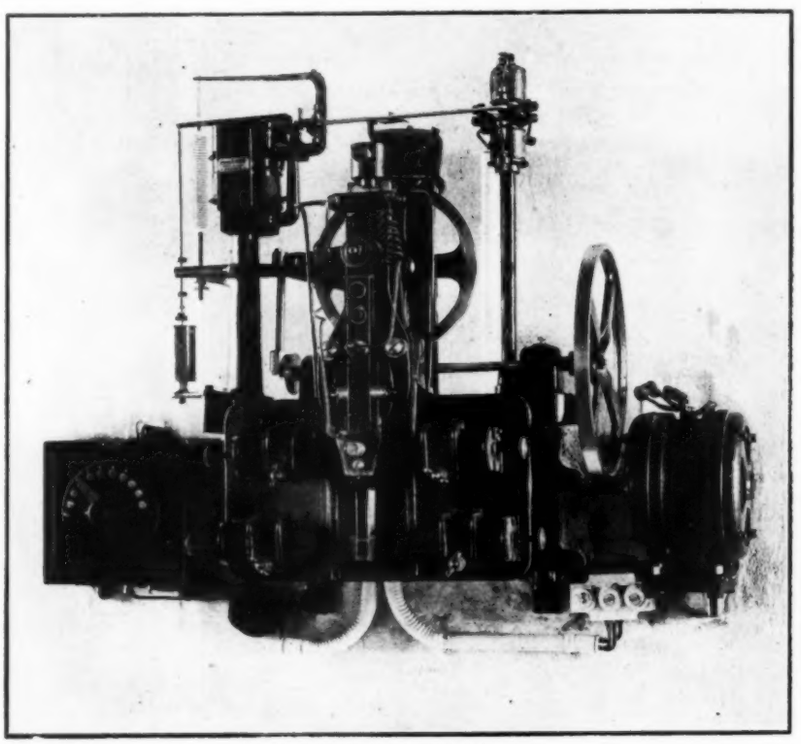


WATER-JET APPARATUS FOR INCOMING LINES.

station. In view of the frequent fluctuations of pressure occurring in the supply pipe as well as of the heavy expense entailed by the constant water consumption, a cooling plant was installed, the Neuhausen water being only used as stand-by and for making up any losses due to evaporation, etc.

The warm water coming from the transformers flows into a cooling tower, traversing there a lath grating filled with blackthorn twigs. The cooling tower can, moreover, be supplied with air by means of a fan. Below the cooling tower is arranged a cooling water tank filled automatically from the Neuhausen water works by means of a float fitted into the conduit. A low-pressure centrifugal Sulzer pump operated by a one-horsepower three-phase motor, drives the cooled water to a reservoir located on the first floor whence it again returns to the transformer plant. The transformers are mounted on wheels and can be run from the cell on to transporting trucks. Adjoining the transformer room is a covered vestibule, where transformers can be withdrawn for inspection and repair. It contains in the floor an oil pit for drawing off the oil.

Owing to the considerable extension of the power transmission plant of the Betznau-Löntsch Company, considerable fluctuations in tension which make themselves felt especially in the lighting circuit, are bound to occur from time to time. In order to compensate for such disturbances, there was installed a regulator plant designed for the full capacity of the main transformer station (3,000 kilovolt-amperes) and a range of regulation of five per cent. Induction regulators, as is well known, afford the best means of regulating the tension of three-phase and single-phase circuits and keeping it constant. In order to obviate any influence of the apparatus on the lag in phase between the current and voltage of the system, there were installed two induction regulators so arranged that for any position, the resultant of the voltage vectors produced by the two regulators has the direction of the voltage vector of the circuit, so that the additional tension in any position of the two induction regulators is added arithmetically to the tension in the circuit. The stators of the induction regulators are series-connected, being wound for a tension of 10,000 volts. Low-tension current of 500 volts derived from a special transformer is used to feed the rotors. The rotors of the two regulators are positively connected with one another, being operated by a small sixteen-pole auxiliary motor, through a worm and worm-wheel. This auxiliary motor, which is fed from a special tapping of the above transformer, can be controlled by hand, or automatically through a Thury regulator, the transition from hand operation to automatic operation and *vice versa* being effected by a three-pole switch. A push-button switch mounted on the first floor below the general voltmeter serves to effect hand regulation. In operating with automatic regulation the Thury regulator automatically throws the driving motor of the induction regulator into circuit, in one direction of rotation or the other.



THURY REGULATOR.

As seen from the diagram of connections, the stators of the two induction regulators can be short-circuited by means of an oil-switch. The drive of this switch is positively connected to another switch which at the moment the stators are short-circuited, cuts out the transformer so as to switch off any tension also from the rotors. When releasing automatically, the latter switch at the same time operates mechanically the former oil switch, thus short-circuiting the stators.

The induction regulators and their auxiliaries, with the exception of the devices for hand and automatic remote control, are situated in the basement. The whole of the plant can at any time be cut out by means of the line switches located on the first floor.

To the 10,000-volt busbars is connected a three-pole cylindrical lightning arrester fitted with carbon resistances. A three-phase potential transformer is used to feed the general voltmeter, registering voltmeter and a recording frequency meter. A static voltmeter and three-pole high-tension switch allows the insulation to be tested.

Five panels were provided for the outgoing 10,000-volt lines, each of which is equipped with a self-acting oil switch and maximum time-relay, three ammeters (one of which has a maximum current gauge) self-induction coils and horn-shaped lightning arresters with water resistances. The switches, measuring instruments and self-induction coils are mounted on an iron frame in front of the switchgear frame of the secondary transformer switches. The lightning arresters and leading-out ter-

minals of the 10,000-volt line are located on the second floor.

In the basement are installed, in the induction-regulator room, two additional transformers for 10,000/250/145 volts with a switchboard and meters; a transformer of fifty kilowatts capacity is used to supply the neighboring community of Neuhausen and another transformer of fifteen kilowatts serves to feed the lighting circuit and the local service of the station.

All the electrical machinery has been supplied and installed by the Oerlikon Machine Works, to whom the writer wishes to express his indebtedness for courtesies shown him in preparing the present article.

International Congress of the Applications of Electricity, Turin, 1911.

An International Congress of the Applications of Electricity will be held at Turin, Italy, from September 9 to 20, 1911, on the initiative and under the auspices of the Italian Electrotechnical Association and of the Italian Electrotechnical Committee, during the period of the International Exhibition of Industry and Labor. Committees have been appointed to make arrangements.

The principal endeavor of the Organizing Committee, in drawing up the programme of the Congress, has been to give the meetings a decidedly international character. The attainment of this object is aided by the fact that the first meeting of the International Electrotechnical Committee will be convened at Turin from September 11 to 16, and the official delegates of the Electrotechnical Committees of several nations will be assembled there.

With the object of securing a definite and complete programme of work at the Congress, the Organizing Committee has prepared an official list of subjects, for which it will appoint lecturers; but besides these it hopes that numerous original papers will be presented by members of the Congress. The president of the Organizing Committee is L. Lombardi, and the secretaries are G. Semenza and C. A. Curti, 10 Via San Paolo, Milan. At a meeting of this committee on December 28 last the following procedure was decided upon:

The opening ceremony of the Congress will take place between September 9 and 11.

The subscription for membership has been fixed at five dollars (25 lire), which is to be paid in advance. Membership carries with it the right to attend all meetings of the Congress and of the various sections, to vote and to receive a copy of the printed transactions. On payment of a fee of two dollars (10 lire), a member's relatives may attend the Congress, without a vote, and take part in all the entertainments and visits of interest.

The president of the Committee of Organization together with the presidents of the foreign electrotechnical committees and the presidents of electrotechnical associations (in those countries in which an electrotechnical committee has not yet been nominated) shall draw up a list of official reporters, who shall be requested to present to the Congress a paper on one or other of the subjects herein enumerated.

In addition to the papers offered by the official reporters the Committee of Organization will be pleased to consider, with a view to acceptance, papers or proposals presented by members or by any electrical association.

Before the opening of the Congress, the Committee of Organization will endeavor to print the papers offered, provided that such papers are received before June 30.

Papers may be written in French, or in English, German or Italian accompanied by a translation or a summary in French.

The above mentioned languages will be admitted in the discussions.

All papers will appear in the transactions of the Congress in their original language. Those in English, German and Italian will be accompanied by a French translation or summary.

OFFICIAL SUBJECTS FOR DISCUSSION AT THE INTERNATIONAL CONGRESS.

1. Electrical and mechanical characteristics of modern electric generators, with special reference to very high-speed machines.

2. Present state of technical progress in the manufacture of stationary and traction batteries.

3. On the simultaneous running of several generating plants, all feeding the same system of network.

4. The selection of the transmission and distributing pressure and the design of switchboards and substations in large electrical installations, taking into account both economy in first cost and continuity of service.

5. Underground high-tension networks in metallic connection with overhead lines.

6. Present state of research in reference to abnormal rises in pressure and means of their prevention and protection of the system.

7. Construction and use of automatic circuit-breakers.

8. Methods of cooling transformers of moderate power.

9. Converters, rectifiers and motor-generators.

10. The problem of frequency transformation.

11. Technical and economic influence on the lighting industry of the new metallic-filament lamp and of the metallized-carbon lamp.

12. Three-phase variable-speed motors, with special reference to rolling mills and paper mills.

13. Monophase traction *versus* three-phase traction on main lines.

14. High-tension continuous-current traction *versus* monophase traction on suburban lines.

15. Overhead line construction for electric railways.

16. Direct production of steel from ores by means of the electric furnace.

17. Sterilization of water by processes employing electricity.

18. Electricity meters with special reference to different kinds of loads.

19. Government control of meters.

20. Rational methods of commercial measurement of electric power.

21. The problem of increasing the load-factor in central stations.

22. Application of electricity to submarine boats.

23. Long-distance wire telephony.

24. Wireless telephony.

25. Automatic telephone exchanges as a means of economy and improvement in telephonic communication in large cities.

26. Research on secrecy in wireless telegraph.

27. Present and future development of electric heating.

28. Comparative study of the direct and indirect methods of taxing electricity in different countries.

29. Government regulations in reference to the electric transmission of power.

30. Distribution of electric power for agricultural purposes.

31. The various systems of multiplex telegraphy.

THE ELECTRIC VEHICLE AND THE CENTRAL STATION.

CAMPAIGN PLAN ANNOUNCEMENT AT BANQUET GIVEN BY THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON, WHICH DISCARDS ITS GASOLINE CARS AND HORSES AND ADOPTS ELECTRIC VEHICLES INSTEAD.

The Edison Electric Illuminating Company of Boston announced its campaign in favor of the electric vehicle at a banquet at the Hotel Thorndike, Boston, Mass., Friday evening, March 4. There were present about one hundred guests representing electric vehicle and electric storage-battery manufacturers, central-station interests, and publishers of the electrical journals. The occasion developed a great deal of enthusiasm and confidence, and was ably presided over by Charles L. Edgar, president of the Boston Edison Company. Guests were present from Chicago and other distant points, and interest in the inauguration of this big electric-vehicle campaign was evidenced on all sides. Over the head of the presiding officer hung a portrait of Thomas A. Edison, and among the letters and telegrams of regret was one from the great inventor, wishing success to the movement.

E. S. Mansfield, of the Edison Company, outlined the plan of campaign of his company. He said in part:

"The Edison Company of Boston so firmly believes in the future of the electric commercial and pleasure vehicle that it has now entered upon an educational campaign for the development of the sales and the exploitation of the field of electric automobiles throughout the entire 550 square miles of its territory.

"The Company is prepared to spend a liberal amount of money, energy and time for the carrying out of this work, and expects the co-operation of manufacturers and agents in making the electric vehicle a success.

"A vigorous advertising campaign is to be entered into, and the electric vehicle has been given its personal indorsement in the strongest manner.

"An inspection staff of unbiased scientific men from the Massachusetts Institute of Technology will visit factories and inspect various makes of machines so as to give advice to prospective owners. A sum will be set aside sufficient to conduct this.

"A number of electric trucks and runabouts have been ordered, and a large number more will be installed to replace the gasoline and horse-drawn vehicles now in operation in its business.

"A business representative is to be appointed who will show the merchants and manufacturers in our territory the use and advantages of electric vehicles as a mode of transportation, both for pleasure and business purposes.

"The Company has opened a public garage on Atlantic Avenue, under the auspices of a committee of the Electric Vehicle Association of America, in which it will care for electric vehicles in the most up-to-date manner, charging a flat rate to cover garage and charging costs.

"The Company expects to order a number of vehicles from those companies who have agencies in Boston, and are interesting themselves actively in pushing the business within our territory.

"The Company expects to have meetings with manufacturers and other representatives at various intervals of time in order to work together for the popularization of this mode of transportation.

"The Company is also prepared to co-operate in any way possible with agents who are demonstrating or who are exploiting in our territory for the advancement of the business.

"A publicity bureau will also be maintained whose business it will be to see that the public is kept in touch with information regarding the advancement of the electric vehicle, and other items of interest in connection with it.

"In planning this campaign the Edison Company expects and asks for the co-operation of all the allied interests, as it is trying to increase the vehicle industry in an unbiased manner and for the good of all."

Mr. Edgar announced that his company would each year set aside a fund of $2,000 for the Massachusetts Institute of Technology, to be used by that institution for general research work, the chief reason for this being the desire to get accurate data respecting the cost of operating electric vehicles, storage batteries, etc.

William H. Blood, Jr., president of the Electric Vehicle Association of America, spoke of the former weapon of offense in favor of the gasoline car, because of the expense of running the electric vehicle. He believed that the rates that can now be secured for the electric vehicle would turn his objection into an asset. He further stated: "Another great problem that we have had to face in the past was proper garaging. The Edison scheme has settled that for Boston, and undoubtedly other central stations will be quick to follow this example in other cities and towns."

Professor D. C. Jackson, of the Massachusetts Institute of Technology, and president of the American Institute of Electrical Engineers, announced his interest in the work and made several practical suggestions respecting the best method of securing valuable and accurate data. He expressed his willingness and desire to assist in the work inaugurated by the Edison Company in every way in his power.

Louis A. Ferguson, vice-president of the Commonwealth Edison Company, of Chicago, spoke from the viewpoint of the central-station man.

Among other speakers, all expressing confidence in the important campaign inaugurated by the Edison Company, and wishing the fullest success, were Frank L. Dyer, vice-president of the Edison Storage Battery Company; Herbert Lloyd, president of the Electric Storage Battery Company; Robert McAllister Lloyd, of the General Vehicle Company; Hugh M. Wilson, vice-president of the *Electrical World*, and Charles W. Price, editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

It is well to record, as nearly as possible, the personnel of this first meeting in connection with the Edison Company's campaign, which the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN believes to be of great value to the central-station and electric-vehicle interests, and which begins so auspiciously under the direction of one of the most ably managed central-station organizations in the United States, and under the personal direction of President Edgar of that company, whose ability and far-seeing carefulness are so widely known and appreciated.

Among the guests were the following:

Edison Electric Illuminating Company, of Boston: President Charles L. Edgar, W. H. Atkins, W. H. Francis, E. S. Mansfield, S. Hosmer, F. G. Havlin, L. D. Gibbs, W. S.

Stevens, L. R. Wallis, R. S. Hale, C. A. White, C. F. Smith, H. W. Moses, C. J. Hatch, A. C. Campion.

Electric Storage Battery Company: Herbert Lloyd, Charles Blizard, Messrs. Ford and Stone.

Edison Storage Battery Company: Frank L. Dyer, W. G. Bee, Harrison G. Thompson.

Gould Storage Battery Company: W. S. Gould, William Walker, Dr. Winship.

Philadelphia Storage Battery Company: Frank S. Marr, D. C. Tiffany.

General Vehicle Company: R. M. Lloyd, Louis Reprecht, Messrs. Day, Baker and Trow.

Electric Vehicle Association of America: William H. Blood, Jr., president; W. K. Blodgett, D. B. Strickland.

Atterbury Motor Truck Company: Robert Seymour, D. E. Gould, F. C. Lindoerfer.

Anderson Carriage Company: N. Rommelfauger.

General Electric Company: Charles B. Davis.

Columbia Motor Car Company: George Strickland.

Bates Advertising Company: Converse D. Marsh, Philip Kobbe.

Studebaker Brothers Company: Col. George M. Studebaker, C. F. Redden, Mr. Kennedy.

United States Light & Heating Company: J. Allan Smith, J. A. White, A. H. Ackerman.

Commercial Truck Company: L. A. Tirrell, S. S. Carwood, E. R. Whitney.

Washington Motor Vehicle Company: A. C. Moses, E. P. Mertz, W. H. Conant.

S. R. Bailey & Company: E. W. M. Bailey, Ralph Whiting, George Holden.

Baker Motor Vehicle Company: Nathaniel Platt, A. F. Neale, R. A. Phelps.

Broc Electric Carriage Company: Frank A. Brand, C. S. Clampitt.

The Waverley Company: Wilbur C. Johnson, J. C. Henderson.

Dodge Couple Gear Freight Wheel Company: W. E. Eldridge.

Automobile Maintenance & Manufacturing Company: L. A. Ferguson, J. W. Emery.

Westinghouse Electric & Manufacturing Company: Messrs. Barr and Brown.

Lansden Company: J. M. Lansden, Frank A. Whitten.

Among the representatives of the technical press present were Charles W. Price, W. D. Weaver, Hugh M. Wilson, H. C. Cushing, George A. Wardlaw and Frank B. Rae.

Water-Power Possibilities in Wisconsin and Michigan.

A recent United States Geological Survey report shows that the streams in northern Wisconsin and Michigan are as yet very little utilized and afford excellent chances for the development of water power. Along the Escanaba, Menominee, Peshtigo, and Oconto Rivers there are many storage sites. All these streams drain a lumbering country from which the better timber has been cut, but the region is thinly settled and the second growth of forest has been so rapid as to prevent any great change in stream flow. The Oconto and Peshtigo Rivers are especially favored in sites for water power owing to their steep slope and large discharge. It has been estimated that 32,000 horsepower awaits development along the Peshtigo.

Big Fire at Minneapolis.

The business section of Minneapolis, Minn., was swept by a fire on March 5, which for a time threatened to destroy almost the entire retail business district. One of the interesting incidents of the conflagration is the manner in which the ornamental street-lighting posts withstood the extreme heat without distortion or being in any way affected. These posts surrounded the entire block which was the scene of the fire and not one was lost. The posts were designed and erected by the Flour City Ornamental Iron Works, of Minneapolis.

State Control of Water Powers in Colorado.

A bill has been introduced into the Colorado Legislature whose object is to further state control of water powers as opposed to federal control. It has the support of the Colorado Conservation Commission. It is believed that the right of possession alone will give the power companies such an advantage that the Federal Government will be compelled to go into court to defend its claims, or leave the power companies in undisturbed possession.

The leading features of the bill are as follows:

1. Giving the State Board of Land Commissioners, as constituted by recent constitutional amendment, the power to license all such power plants wherever situated, and confer on the owners of plants depending on water power the full legal right to use the waters of the State to which they show themselves entitled under the laws relating to priority, without any other charge whatever, thus giving them legal standing to resist any federal charge, directly or indirectly, in that respect; the charges for licenses to be fixed by the board with due regard to the rights of all concerned. Licenses to be limited to a period not exceeding fifty years, with privilege of renewal upon fair terms, but forbidding assignments of licenses without approval of the Board, such approval not to be refused except for good reasons. The bill will also give *bona fide* operators a speedy remedy against "hold-up" filings on power sites, which heretofore have been serious obstacles to water-power utilization.

2. Authorizing the board to fix the rates to be charged to users and make such rules and regulations as to operations as may be fair to all concerned, but not interfering with rates to citizens made by incorporated towns and cities owning their power plants.

3. Authorizing readjustment of charges for licenses and rates to users at the end of each ten-year period, or oftener if good reasons appear for doing so.

4. For the purpose of fixing charges to operators and consumers, the board to have the right to examine books and papers relating to cost of construction, operation and all other matters affecting the subject.

5. Providing for appeal from any order of the board to the District Court, and also to the Supreme Court.

6. Declaring violations of the act and all combinations, trusts or monopolies inimical to public interests, unlawful, and providing penalties therefor.

7. In the event the United States shall authorize the granting to the state power sites, etc., the board is empowered to select the same.

8. Authorizing the exercise of eminent domain by power companies to acquire easements for power sites, rights of way, etc., over private and public lands, including national forests and other reserves, as well as that now or hereafter temporarily or permanently withdrawn from entry as coal, oil or phosphate land, power sites, etc., except lands held by the United States for military or other strictly governmental purposes, the jurisdiction over which has been ceded by the State to the United States.

9. Authorizing the power companies in condemnation proceedings to take possession of such public lands, the same as is now provided in case of private lands, and to make the Secretary of the Interior a party defendant in condemnation of easements over public lands, he to be notified by registered mail, the same as that department brings contestants before its land offices.

Electrical Education.

Co-operation between the instructor of electrical engineering and practicing engineers as a means of better fitting the student for his work in life, was earnestly advocated by Professor E. H. Freeman of the Armour Institute of Technology, in an address before the Chicago Electric Club on March 8.

Prof. Freeman spoke on the subject of electrical education and he enumerated the conditions imposed upon the schools in selecting suitable material for the various instruction courses. In this connection, the two fundamental principles which guide instructors in selecting such material are (1) acquisition of knowledge by the student and (2) the application of this knowledge in solving engineering problems. The student desires primarily to acquire and the instructor's aim is to train the minds of the students.

Speaking of specialization in the various branches of electrical engineering Prof. Freeman said that it is extremely difficult to anticipate the special knowledge which a student might require and it is therefore advisable to limit the specialization as much as possible. In accordance with this view the special courses at his school are limited to electric railway engineering, telephone engineering and illuminating engineering.

Prof. P. B. Woodworth, who spoke briefly at the close of Prof. Freeman's address, emphasized the necessity of engineering education along general lines and cited several common instances to substantiate his views.

UNDERGROUND CONDUIT CONSTRUCTION IN DOWN-TOWN NEW YORK.

BY S. D. LEVINGS.

The work here described has been made necessary by the growth of subscribers lines in the plant of the New York Telephone Company. Aside from the causes which have forced it into existence, the engineering details and construction methods present some distinctly novel and interesting features. At the time the original conduit, which is now being increased in capacity, was constructed, little was known concerning telephone-development studies to determine future possible telephone growth. Ducts were installed when aerial lines became overloaded, or ordinance forced them underground, not according to any predetermined engineering calculations, but according to the judgment of the individual in charge of the distribution plant. In many cases the original capacity suffices, but in many others it has long since been but a portion of today's needs.

There are other circumstances which

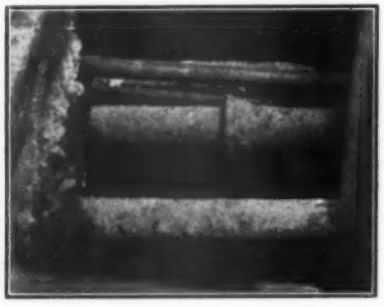


FIG. 1.

play a very important part in the history of the underground telephone plant. Not more than ten years ago, the largest underground cable to be found in the plants of the largest companies was 200 pairs of No. 18 or No. 20 B. & S. conductors. Today, 600 pairs of No. 22 conductors are commonly found incased in a single lead sheath serving telephones in the congested areas of the larger cities. Due then to the increased efficiency in the art of telephone-cable manufacture, we are today able to place in one duct the same number of subscriber's lines that formerly required three ducts. This in itself is a very important item when considering a comparison between past and present design. No more significant facts can be presented to show the enormous and unexpected growth in telephone requirements, than to say that after replacing the small sizes of original cables with cables that increased the capacity of each duct by 200 per cent, the underground-conduit plant in many locations, in almost every large company, was still inadequate to care for the facilities. In the plant of the Chicago Telephone Company there exists a 900-pair 25-gauge cable, particularly designed to relieve congested conduit conditions. Thus have the engineers been fighting the inevitable, simply in an effort to stay the enormous investment necessary to provide increased facilities.

The design of the distribution plant is now just as much a matter of principle as that of the switchboard on the telephone circuit. But it has not always been so, and only on account of time and growth in the number of telephones has it been possible to study and formulate rules upon which may be based distribution plant requirements. Time has shown that certain definite increases in the number of subscribers' lines takes place in localities bearing similar "ear marks." The engineer is now able to look at an office building, an apartment house, or a factory, and very closely determine the present and future telehone needs of each. The universal adoption of the telephone as a means of quick communication has made such a procedure possible. The engineer is able to go into a newly developed area, size up the class of building construction, transportation facilities, natural resources, etc., and prognosticate with certainty in the large majority of cases just what the telephone development will be initially, five, ten or twenty years from today. Further, by close scrutiny of real-estate development he is able to provide facilities for existing vacant lots, knowing that within the life of the underground plant they will be built upon, and the occupants of such buildings will use telephone service.

Methods of relief for overburdened conduit systems are two in number. First, an entirely new duct system may be constructed paralleling the old one,

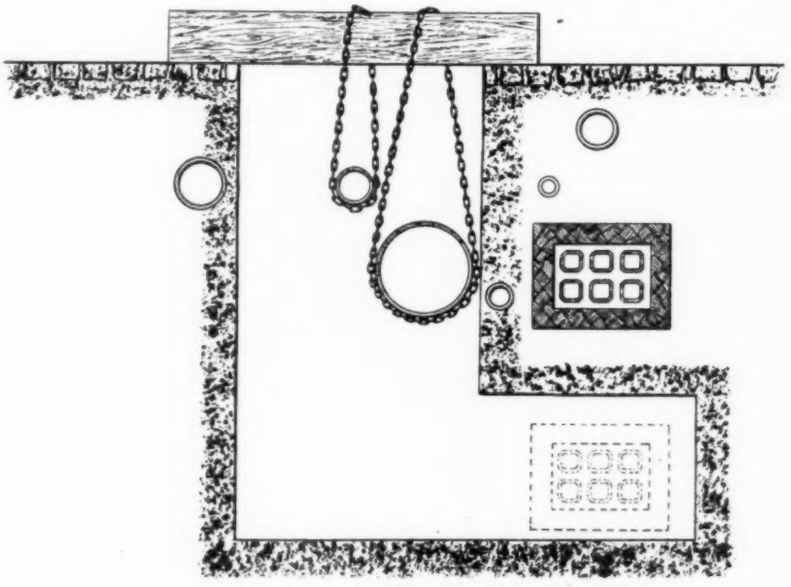


FIG. 2.

and complete in itself with manholes, local distribution branches, etc., and may be connected to the original system by means of ducts between manholes. Second, the old system may be reinforced by additional ducts, they being let into the original manholes and the necessary changes made in the shape and size of the latter. In the smaller cities, the first method, where a large number of ducts is to be installed for relief and to care for future growth, is generally the most economical. Foreign structures in the streets are not numerous in such cities, and the cost of remodeling old manholes to provide for the entrance of new ducts,

is frequently greater than for new manholes, considering the necessary care that must be given to existing plant while construction operations are in progress. The amount of excavation necessary for a new and distinct system is no more than for an addition to an existing one, and considering the hazard to the existing working plant, the individual system is much to be preferred where physical conditions admit of such a plan.

In the case of large cities, however, where the streets are full of foreign structures, the reinforcing or second plan is generally most advantageous from all aspects, and it is this type which constitutes the subject of the following description. I cannot, without recourse to widely scattered records, enumerate the number of structures existing in the down-town streets of New York City, operated by public service corporations, but from a general knowledge of them I should say that the following types of structures are to be found:

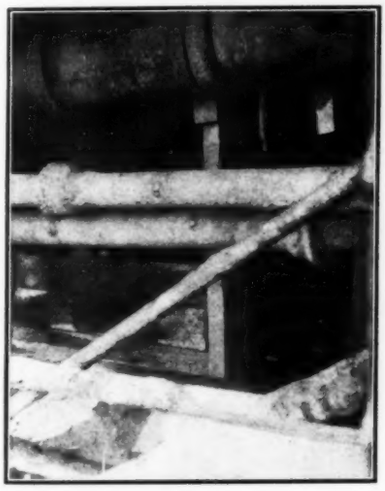


FIG. 3.

(1) Empire City Subway Company. Two conduit systems, one for telephone, the other for electric light and power.

(2.) Gas mains, several in number, occasioned by unlooked-for growth.

(3.) Water mains. High-pressure fire department, local supply and distributing mains.

(4.) Western Union Telegraph Company's conduit system with innumerable laterals to buildings.

(5.) Gold Stock Ticker Company's conduit system with a like distribution of laterals.

(6.) Postal Telegraph Company's conduit system with laterals.

(7.) Steam-heating pipes from various centers to other buildings along the street.

(8.) Sewers ranging in number from one to four.

In addition to the plant enumerated above, there are service pipes and laterals in legion. In the particular location in which the work under description was carried on, all structures are very near the surface of the street, a covering of not over twenty-four inches below paving grade being the average. This is made necessary on account of the land being practically at the level of the sea, and at high tide, the whole substrata is flooded with water. The part that this plays in conduit work will be taken up subsequently.

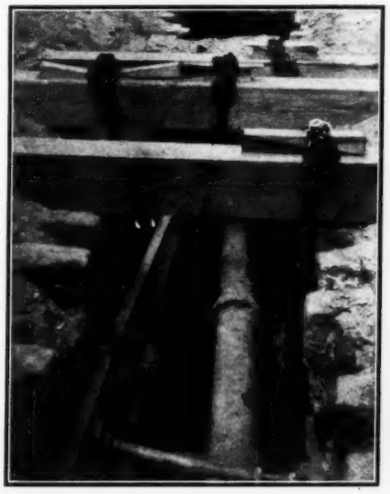


FIG. 4.

The Empire City Subway Company owns practically all of the conduit system in New York that is used by the telephone and Edison companies. It rents space to the public-service corporations as desired, and whenever facilities are needed, the Empire Company has to provide them.

The conduits lying in the territory bounded by Gold, Pearl, John and Wall Streets, and occupied by the New York Telephone Company's cable plant, have just been reinforced with added facilities. The problems which are faced in this particular work, lying as it does in the oldest section of New York, cannot possibly be duplicated in any other city in the world. The methods adopted by the Empire Company are exceedingly interesting and instructive.

From a glance at the list of underground structures existing in the streets of this territory, which are very narrow, not over thirty-five feet in the roadway on an average, it may obviously be inferred that they are the cause of the great expense and labor necessary in constructing a conduit system in a new location, or beside an existing one. Test holes such as are ordinarily opened to determine the existence of foreign structures, are useless in the down-town streets of New York. You may abide by the rule, without gainsay, that there is not a clear space existing that is over two feet wide at the outside, and 1.5 feet for an average. Fig. 1 shows a portion of the excavation for a manhole, which contained 6 obstructions, and the 1.5-foot-separation rule certainly obtained. This excavation at the time it was photographed was but four feet square approximately, and its nearest edge was but three feet from the curb line.

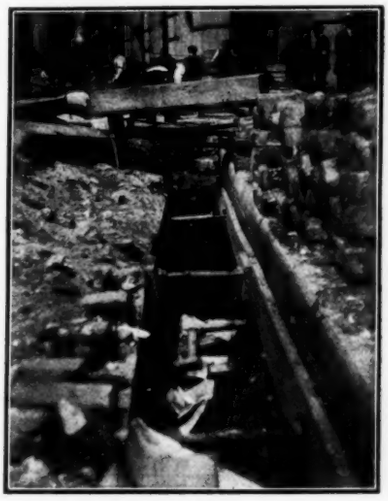


FIG. 5.

In these streets it is not a case of excavate where you will, but where you can. Foreign structures show a great perversity in the matter of location, and it is a rare case when an excavation can be made at the logical point. For this reason the nearest free space between the obstructions must be chosen. When the excavation has been carried to a depth that is below that of the majority of the foreign structures, it may be shaped to any desired form. Fig. 2 shows the method generally adopted in excavation work of this nature, where an existing conduit run is to be reinforced for facilities. It

will be noted that undermining is resorted to, and this operation with its attendant bracing, stepping and shoring, entails a large expense.

Many times it is a difficult matter to find room to wield a shovel. The obstructions therefore cause this work to fall, in rate of progress, far below that where the streets are ordinarily free from obstructions. Once a hole has been started and the under level of the obstructions reached, they still form a barrier when throwing the material out of the trench. In the majority of cases, stages must be slung from the braces supporting the obstructions, the earth being lifted from the trench to the stage and thence to the street. Fig. 3 is a view looking down upon one of the stages. Such methods mean two handlings of material with the attendant increase in cost per cubic yard of excavation. As excavation charges form a large percentage of the cost of conduit construction, it can readily be seen that the cost curve on this work will reach a much higher level than for that under normal circumstances.

As the foreign structures are uncovered during the progress of the work, they must be carefully maintained in position. The company doing the work is, by laws written and unwritten, responsible for the safety of such plant. The care of these structures is another heavy burden of expense. Fig. 4 is a view showing the method of supporting these structures, and the provision made for adjustment of level will be noticed. The supports are generally 6-by-6-inch timber, bedded on either end directly on the pavement to prevent change in level, should any earth that they might rest on be washed from under. Most sections of the trench are spanned by these supporting timbers at intervals of from one to four feet, averaging three feet.

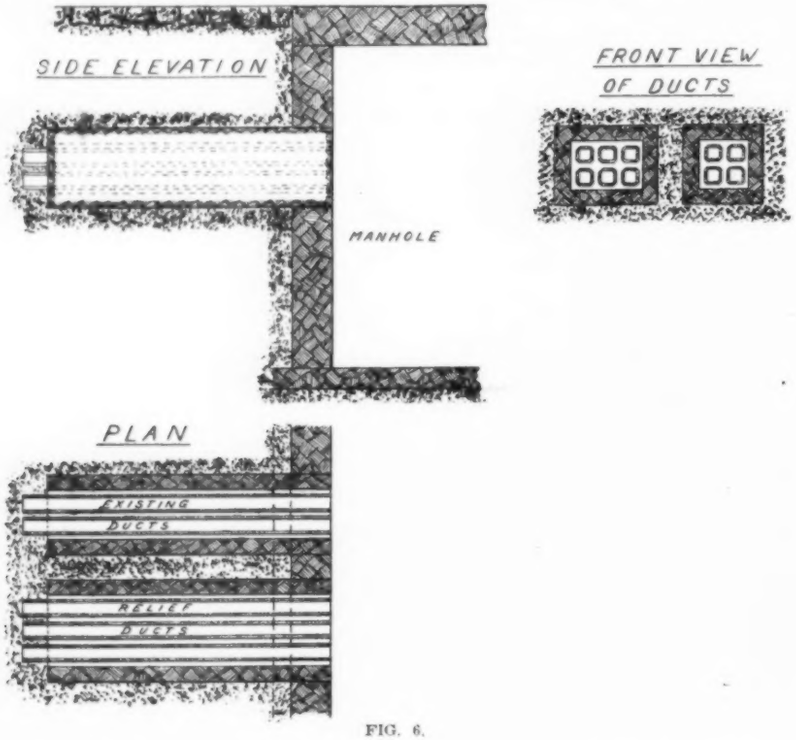


FIG. 6.

Logging chain is used for the supporting medium, and is slung around the pipe, or conduit section as the case may be, in the manner shown in Fig. 4. The level adjustment is obtained by means of wedges placed under the chains at the point of contact with the supporting timbers as shown. The support in the foreground is holding a pipe which is crossing the trench at right angles, and it will be noticed that all of the adjustment in the wedges has been taken up. That just back of it is holding a pipe lying parallel to the walls of the trench, and it will be noticed that there remains considerable "take-up" in the wedges. This photograph and that in Fig. 3 strikingly illustrate the conditions of the downtown streets of New York, and are typical of the roadway from curb to curb.

Another expense of no inconsiderable importance is the work that must be performed to keep a portion of the roadway clear for traffic. In addition, then, to the excavating gang, a surfacing gang must be kept at work throwing the material into solid piles, thus preserving a free space. The streets are narrow and traffic suffers greatly notwithstanding the unusual care that is taken to keep free the space allotted to traffic. The soil, in this particular section, does not lend itself to solid piling. It is rotten earth mixed with loose sand, and all construction men know what it means to preserve lines with this class of material. In fact, the earth is so porous and rotten that tide water is encountered at a depth of from four to five feet. This is

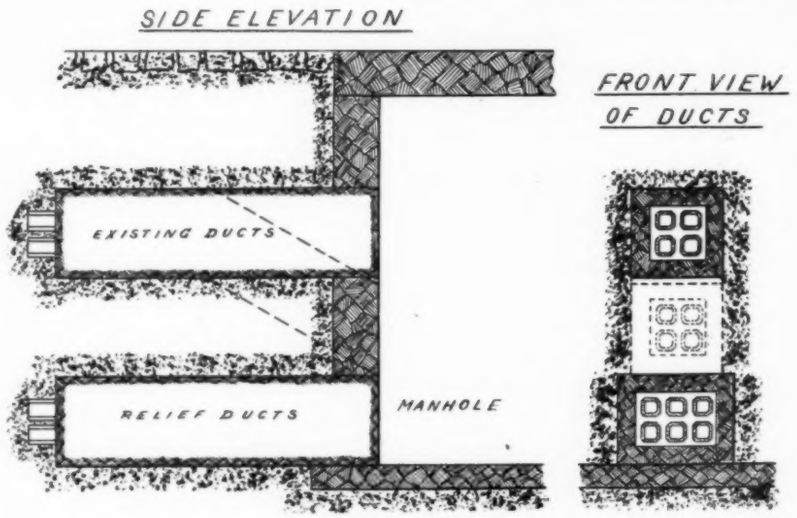


FIG. 7.

a condition that is strange to those working inland. As the tide comes in, the water begins to rise in the trench, which is fairly well drained at low tide, and it is not long before some kinds of operations must cease, the gang being transferred to other work, until, in from eight to twelve hours, the water again subsides. This tide water more seriously affects the actual duct laying than other operations, and they may be carried on for the major portion of the time, ignoring the water. Lagging or sheeting is resorted to in a number of cases, especially in lining excavations for manholes. The sheeting is hand driven, but even then increases the manhole cost enormously.

Owing to rotten earth, obstructions and tide water, practically all of the trench walls must be strung with timber to prevent cave-ins. Shoring is out of the question for the above reasons. Fig. 5 shows a section of trench with the stringers or side braces in place. They consist of 2-by-6-inch timbers, held apart by a very homely but efficient jack. This jack is an adaptation of the regular screw type, long handles being provided on the movable member. Thus the necessity for a piece of pipe to gain leverage is eliminated, so that they may be extended by hand. Where the jacks will not span the trench, pillow blocks are placed to compensate as shown.

As illustrated in Fig. 2, it is often necessary to undermine the trench to make room for the new ducts. The logical method by which to bring an existing and new section of conduit into a manhole, where ordinary conditions obtain in the streets, is as shown in the drawing in Fig. 6. The two duct formations are laid at the same level and so enter the manhole. In the present work, however, the enforced undermining necessitates bringing the ducts into the manhole as shown in Fig. 7. The dotted lines represent the ultimate location of the existing ducts, after the new ones are in place. This change from the horizontal to the vertical plane, is a simple proposition as stated on paper, but that it calls for a large investment in labor is apparent.

Where, under ordinary conditions, two laborers can hand the tile to the men in the trench, during laying operations, in this case it must be slung down to them by means of a rope which is passed through one of the duct openings. It is often difficult to lower the duct at the point of laying, on account of the lack of space between obstructions. It must therefore, in such instances, be carried to the nearest available opening, lowered and brought back to the point of laying. It sometimes occurs that small lateral pipes will lie in the path of the ducts, and they must be raised or lowered, or else the ducts must be. Generally the lateral is lowered, as no pockets are desired in a line that is to be entirely submerged in water every twelve hours. This condition rquires great care in laying the ducts. Neat cement mortar is employed to gain the proper level.

All joints must be closed by muslin saturated in neat cement mortar which, after they are in place, are again covered with a thin film of the same material. A three-inch envelope of concrete is placed around the ducts.

Manhole construction is enough to strike terror into the heart of the strongest construction man. The obstructions always come at the wrong point. Concrete cannot be used except in exceptionally free spaces, as the cost of the forms is prohibitive, considering the obstructions. Brick can be made more flexible in a shorter period of time, and is generally employed, a concrete roof reinforced with expanded metal being placed over the manhole. A large portion of manhole expense accrues through the necessity for removal of the existing ones in whole or in part, and where remodelling is done, it is resorted to in an effort to simplify conditions rather than to save expense.

Throughout this work, existing plant must be kept in operation. Where whole manholes are often demolished to make room for larger ones, the mass of cables in them must be properly sustained in place. This is done in several ways. If detachable manhole cable supports are in use, the cables may be bound to them at several points and when they are removed from the walls, will maintain their position in fair shape. In other cases the cables must be supported in various ways, and at such points as will maintain them in their original positions as far as possible. Fig. 8 is a view of the cables that have been exposed by the removal of the old manhole walls, and the supports can readily be seen. It must be understood that but very few bends in a

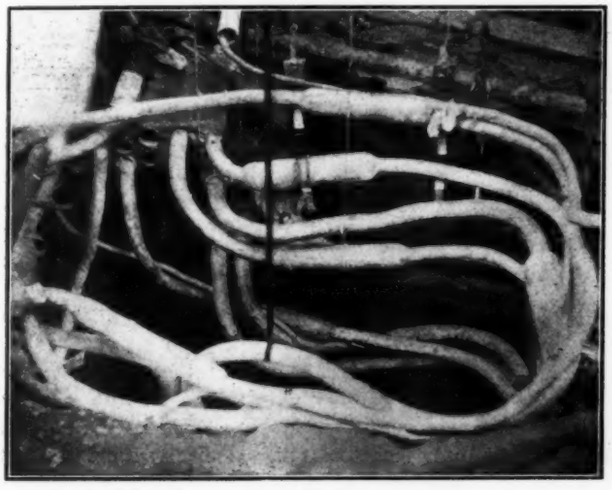


FIG. 8.

FIG. 9.

cable near the wiped joint of the splice, will work irreparable damage, and this attention to existing plant must of necessity be faithfully observed.

Traffic regulations require that all excavations be well bridged for pedestrians and vehicles. A portable bridge is used by the Empire Company, which can be knocked down and erected at any location where foot passage is desired. Fire hydrants must be kept clear of material on all sides for ten feet, and access must be provided to them. Rather than bridge the trench which is both costly and obstructive, the regulation has been complied with by attaching to the fire hydrants an extension of three-inch pipe, having upon the end couplings complying with fire-department regulations. Fig. 9 shows the corner of Pearl and John Streets, and in the foreground may be seen a fire hydrant with its extension.

Two things are essential in this work, an efficient foreman, and a high grade of labor. The foreman must be an engineer in knowledge if not in name, and must be capable of placing his men where they will perform the maximum amount of service. With a proper organization, some speed may be attained, but lacking this, none. Each foot brings to light a new problem that needs individual attention, and the one in charge must have a quick solution.

Now as to the lesson to be learned. Had the present knowledge of the art of telephone engineering been known at the time the original duets were laid in these streets, the enormous investment that is now going on, would have been eliminated. The growth of the section served would have been studied, the needs deduced, and the proper capacity in the original installation provided.

Electrical Exports for January.

The Bureau of Statistics of the Department of Commerce and Labor, Washington, D. C., has completed its monthly summary of imports and exports of the United States for the month of January, 1911. From this the following facts relative to electrical exports are derived.

As compared with the preceding month and the corresponding month of a year ago, the figures for January show a gratifying gain, particularly in exports of electrical appliances (including also telegraph, telephone and other electrical instruments), in which this month was exceeded only by the month of May, 1910. Moreover, the total electrical exports for January came close to the record total last May.

The comparative monthly data are as follows:

Month.	Electrical Appliances.	Electrical Machinery.	Total Electrical Exports
January, 1911	$965,936	$687,536	$1,653,472
January, 1910	621,469	565,838	1,187,307
December, 1910	826,183	646,639	1,472,822

A list of the principal countries to which electrical products were sent, together with the values of these shipments last January, is as follows:

Exported to—	Electrical Appliances.	Electrical Machinery.
United Kingdom	$ 45,046	$ 54,032
Canada	330,851	139,630
Mexico	71,694	122,419
Cuba	40,018	20,057
Brazil	130,610	18,482
Other South American Countries	35,026	27,639
Japan	103,669	147,168

Chemical Action in High-Tension Windings.

A paper with this title was read before the Manchester (England) Section of the Institution of Electrical Engineers on February 14, by A. P. Fleming and R. Johnson. It described researches into the causes of the chemical action and consequent breakdown in the windings of high-voltage machines. The investigations, as reported in *Electrical Engineering*, show that no case of chemical action has been observed on windings having a lower voltage than about 3,500 to earth; and that such action only occurs where air-pockets are present, and then only when the voltage across them is high enough to produce a discharge. While the action commences on the surfaces of the insulation exposed to air-pockets, the gases produced may be carried beyond the zone of formation.

The action of the products of the discharge—whether these be ozone, oxides of nitrogen, nitrous or nitric acid—on the insulation is most commonly one of oxidation, and the effects produced are as follows: Untreated cellulose materials have their fibrous structure destroyed, and disintegration follows. The oils and gums in insulating varnishes are subjected to super-oxidation and yield organic acids. Linseed oil is most readily affected, but certain asphaltum compounds are attacked only to a limited extent. Mica is itself unaffected, but the cements used in building it up are liable to attack. The authors also find that the production of nitric acid is not essential for deterioration of the insulation to occur, although, when it is produced, the action is greatly accelerated. The final disintegration of varnish-treated materials is greatly accelerated by the action of the released organic acids.

Failure due to chemical action is almost invariably the result of a short circuit between turns, and not a breakdown of the slot insulation between windings and frame. The short circuit is caused either by a destruction of the insulation on the conductors, which allows the turns to make actual contact, or by the hygroscopic and therefore conducting matter formed between conductors when nitric acid is present.

The authors' experiments showed that unless the air in the cavities of the winding is replenished by "breathing," the chemical action will cease. They also find that when the stress is very high, deterioration other than that due to chemical action may be produced. Thus, if the insulation is made up partly of materials such as mica, of high specific inductive capacity, and partly of material such as paper, of low specific inductive capacity, the insulating value of the latter may be destroyed on the application of a high voltage without the insulation as a whole breaking down, as has been proved before in the case of cables. They conclude that for the range of voltages at present used, failure of machines from chemical action is not to be expected when the average stress across the slot insulation is less than about thirty-five volts per mil, with any of the methods of winding and insulating commonly employed. A much higher average stress than thirty-five volts per mil is safe when the size and number of conductors permits the best method of grouping and insulating to be employed, and when the interstices are properly filled with an asphaltum compound. The paper contains detailed suggestions in this respect. Mica is recommended for use between turns, and the more thorough impregnation of the windings before and after applying the slot insulation is urged. Finally, the authors point out that the green discoloration which frequently occurs on coils treated with linseed-oil gum varnishes should not be confused with the chemical action due to high voltage. Such discoloration is quite harmless with the best varnishes.

Electrical Notes From Great Britain.

By Our British Correspondent.

The telephone question is very much to the fore just now and doubtless it will continue to be so until the purchase date arrives. It will then assume a new phase, for already there are unmistakable rumblings foreboding trouble when once the service is out of the hands of a private company and the public is in charge. Clamorings for lower charges to telephone users, and demands for higher wages and better conditions of service, may be handled on a business basis so long as business men, who are interested in earning dividends for shareholders, are in control; but place the operating of an undertaking under the control of the Government and who can resist demands for equality of treatment on the part of employees, or for readjustments of telephone charges to meet the requirements of the authorities with the loudest voice? Though the valuation proceedings are still far from complete, and the transfer is close upon a year away, the operatives employed in connection with the London telephone service have just held a mass meeting at which they have laid down what they regard as their just claims for the attention of the Government authorities. They say first that they must not suffer any loss as a result of the transfer, that their service with the National Telephone Company shall be counted as service with the State, that the whole of the permanently employed staff of the company shall be placed upon the establishment of the Post Office; and, lastly, that the staff shall not be subject to qualifying or eliminating examinations as an essential condition to promotion or any other purposes. These claims are only the beginning, doubtless. Turning now to the question of charges to users, in a few days the conference of local authorities, called by the Glasgow Corporation, will be held in London, for according to present expectations 250 delegates representing 186 towns will meet on February 27 with the object of bringing pressure to bear upon the Postmaster-General to induce him to have the whole question of telephone rates considered by a select committee. The real object is to secure the use of the telephone at very cheap rates, but the Postmaster-General and his technical staff will have very many problems and developments through their hands yet, and while a wide expansion of the telephone system would be likely to result from lower charges, the authorities will do their best to insure progress taking place on a busines basis. Whether the other influences of a political kind that sometimes exert themselves in connection with state-owned enterprises will allow them to succeed in that laudable object, is at least open to doubt when one remembers the power and pressure of organizations of workers.

The London United Tramways, Limited, to whose inability to pay preferred and ordinary dividends reference has been made in these notes on several occasions, is still struggling with adversity. But its struggles are now lightened by a brighter hope by reason of the progress that has lately been made with the much needed extensive repairs to permanent way and rolling stock for which preparation ought to have been made years ago instead of paying too-good dividends in the early days. The system has now received benefit from a new system of fares which came into force nine months ago; over 3,500 rail joints have been repaired by cast welding process; a number of crossing frogs and points have been replaced; nearly the whole of the rolling stock has been passed through the repair shops for complete overhauling and renovation; a new system of chain-grate stokers has been installed in the Chiswick power station and other improvement made to the plant; the depot workshops and stores have been altered so as to afford greater facilities for repairing the rolling-stock, and for handling materials; and sixty cars have been fitted with top-covers, to be followed by similar additions to forty others. All of these alterations will help to put things on a better footing, but temporarily extensive way repairs have naturally disorganized traffic somewhat. However, this interruption did not prevent an increase of 3,250,000 in passengers carried, bringing the total up to over 60,000,000. The gross receipts during 1910 were $1,668,295 and the general expenses, maintenance and repairs $1,171,055. After paying interest on debenture stock and loans there is only $154,070 remaining and of this $150,000 has been placed to renewals and contingencies fund with only $4,070 to carry forward.

The question of conveying systems is one of increasing importance from an electrical point of view in connection with Post Office engineering and equipment. You recently gave an interesting account in your pages of an extensive installation at a new Postal Building in New York (ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, January 21, 1910), and readers of that article would also be interested in the extensive conveyor system which is installed at the new Post Office Building in London for facilitating the handling of mail matter. It consists of three band conveyors for mail bags, one conveyor to carry baskets of letters, and a ropeway to carry baskets of letters placed in carriers. There are further six small band conveyors fixed on facing tables. The bag conveyors are of twenty-eight-inch woven cotton bands running at four feet per second, each being driven by a three-phase motor (440 volts) through suitable speed-reducing gear. The basket conveyors consist of an eighteen-inch rubber and canvas band running at the rate of five feet per second; it is of the endless type and the carriers are pulled along go and return rails.

The new regulations relating to the use of electricity in mines have now been published. The Government committee which was appointed some seventeen months ago to report on the necessity or otherwise for revising the rules which came into force in 1905 has found that the rapid progress that has taken place in this department of electrical activity, the change of system from direct to alternating current, longer distance transmission, and the continuous improvement and development of apparatus by manufacturers and their designers, have been so great as to require considerable alterations. For the same reasons too, they regard

it as essential that in the future revision should again take place periodically. The Committee first explains various considerations that have led it to make changes in different directions; it then gives the revised rules in full; and these are followed with detailed memoranda relating to them. In recent controversies here there has been a strong expression given to the view that those who have to do with electrical equipment and apparatus underground should be proved to possess adequate electrical knowledge to insure efficient working, and their own and their fellow-workers' safety. The report requires that the colliery manager should himself possess a general electrical knowledge, not that of an expert, but sufficient for general control, while he must have under him competent electrical men capable of supplying the detailed electrical training and knowledge.

The new rules are too extensive to briefly summarize here, but it may be stated that the general object has been to call for improved construction and better maintenance. No attempt has been made to specify particular types or designs of apparatus, though this was suggested to the committee; that body prefers to set out clearly the conditions to be complied with, leaving it to the engineer and to the manufacturer to determine the exact way in which to meet those conditions by proper construction. This will neither hamper progress, nor lead to less care being given to maintenance, as it is thought might happen if official approval were given. To specify conditions only is considered to be the right way to proceed in order to maintain a high standard without interfering with commercial requirements or the natural development of apparatus. The main directions in which the committee has sought to strengthen the requirements are these: (1) By prohibiting the use of electricity in parts of a mine where on account of the risk of explosion such use would be dangerous; (2), by providing that inflammable material shall not be used in the construction of motor rooms where there exists the risk of fire; (3) By more stringent regulations as regards the grounding of the outer coverings of apparatus; (4) By clearly setting forth the conditions to be fulfilled by switchgear; (5) By insisting upon the better mechanical construction of cables and apparatus; (6) By providing for the proper supervision of apparatus.

The arguments of those who have agitated for more efficient supervision and inspection of colliery installations receive substantial endorsement, and it is shown that however high the standard of construction and maintenance, such supervision is still absolutely essential.

A demonstration of the Holmes-Alderson safety fire-damp detector for mines was given by Geoge Ralph at a recent meeting of the Institution of Electrical Engineers at Newcastle-on-Tyne. The device is the invention of Mr. Alderson, who, previously to his going out to Johannesburg, where he now is, was engaged in mining electrical work in the Newcastle district. The idea of employing a fire-damp detector in conjunction with motor-control gear was due to him. By means of a suitable switchgear, the restarting of a motor protected by the fire-damp cut-out is rendered impossible to the ordinary attendant after the detector and cut-out have operated, as it is necessary for some responsible person who has the key of the cut-out box to be summoned to unlock the box and reset the solenoid core. Such responsible person would, of course, examine the place for gas and see that it was made safe before switching on current again. The detector can be employed to act as a continuous inspector for fire-damp, and to indicate the fact of its presence to some remote place, such as the shaft bottom or even at bank. The indication is given by lighting up a red lamp and ringing a bell, which will continue to ring until attention is given. Mr. Ralph mentioned the importance of this quality of continuous inspection and immediate notification. We have heard a good deal lately concerning the unwillingness of workmen to report the presence of gas, especially in connection with the Lancashire pit-disaster inquiry, and Mr. Ralph remarked that although men working at the coal face have clear indication of the fact of gas being present given them by their safety lamp, inquiries made after an explosion show that such indications are frequently unnoticed or ignored by workmen.

ALBERT H. BRIDGE.

LONDON, February 22, 1911.

George A. McKinlock on International Questions.

"Chicago should some day be the world's finest city, because its ideal is higher than that of the great European capitals," said George A. McKinlock, president of the Central Electric Company of Chicago, to the Paris correspondent of the *Daily News* (Chicago) on February 21. "While it is generally true that Paris spends much more for public improvements and does not fear to tear up neighborhoods extensively in order to form new parks and streets, yet I repeat that the Chicago ideal is higher."

Speaking of civic developments in Chicago, Mr. McKinlock said:

"Every one approves the 'Chicago plan' and the people soon will find means to trample down the political barriers raised against it. After all, Chicago is not so bad. I have seen streets both in London and Paris that were muddier than those in Chicago and my wife says that the London smoke is quite as bad as Chicago's.

"I am sure Chicago would not tolerate for an instant the unventilated, congested and dirty condition of the Paris theaters, all of which have seats that let down in and block the aisles. Europe tolerates abuses because it is the custom—abuses which Chicago believes it is possible to circumvent."

"What do you consider the greatest lesson which Europe teaches America?"

"Personally, I find that my viewpoint of international politics is wonderfully freshened whenever I visit London and Paris. America must soon take a greater interest in international affairs. It is in a favorable position to lead the movement for international peace, but it cannot do so until it comprehends the tangled politics of Europe. Then it may be able to teach the nations of the old world the value of being less prepared to jump at one another's throats."

"What is the greatest aid to the peace movement?"

"Modern facilities for communication. Formerly wars could be begun and ended almost before the news reached the great powers. Today the newspapers, aided by the telegraph and the cable, make the world's public opinion a great court of honor so powerful that it can almost prevent war at a day's notice."

Electrical Notes from Continental Europe.

By Our Paris Correspondent.

Large alternator groups driven by gas engines are used quite extensively at the mining and blast-furnace works of Lens, in the north of France. It is intended to use six of these groups and at present there are three in operation. Each group consists of a 1,100-horsepower gas engine of the Augsburg-Nuremberg make coupled to a three-phase alternator. The engines are of four-stroke two-cylinder type with cylinders in tandem and double acting, so that there is an effect produced twice per revolution. By adding a twenty-five-ton eighteen-foot flywheel, the whole gives a very regular working which is well adapted for dynamo running. This was needed in order to be able to couple the 1,100-horsepower machines in parallel, and also to couple them on the circuits of other alternators of the Lens plant which are run by gas engines or steam engines. The present groups are operated at 107 revolutions per minute. The ignition current for the gas engines is furnished by storage batteries. One set of thirty small cells is employed here and a second battery of the same kind is charged at the same time, so that there will always be one battery in use. A nonsynchronous motor and eighty-volt generator set is mounted for the charging. In order to start up the gas engines, compressed air is stored in tanks and these are supplied by a three-phase motor and air-compressor group in the basement. The gas engines drive 1,000-kilowatt three-phase Westinghouse alternators of French build, working at 5,000 volts and fifty cycles. A rotary exciter group is used with these machines, consisting of a seventy-five-kilowatt nonsynchronous motor coupled to a 125-volt direct-current generator. The motor is operated on a 200-volt circuit.

An extensive project is being developed in Russia in order to bring current to St. Petersburg over a long-distance line from hydraulic plants in Finland. It is claimed that a large amount of power can be secured from Lake Saima. Water is to be taken off by a tunnel flume of 1,500 meters length leading to a turbine plant at Kurmanjoki and in this way a high fall will be secured. The project calls for the use of 100,000 kilowatts in this way, and the power line will be operated at 110,000 volts. It will distribute current not only to St. Petersburg but also to some of the large centers in Finland.

One of the new French hydraulic plants is located on the Cher River in the neighborhood of Montlucon, and it works in connection with a steam plant erected in the town itself. In the hydraulic plant are installed Neyret-Brenier turbines, and at present two groups of 2,000-horsepower are set up. However, there are to be added a number of 2,500-horsepower sets before long. The total output of the water supply is 15,000 horsepower. The present plant and the power network are controlled by the Central Power Company. In the hydraulic plant are used alternators of the Alioth type, generating power at 4,000 volts, and transformers raise this to 20,000 volts for the power line, which is operated on the three-phase system. The city steam plant uses Curtis turbines built at the Paris works of the Thomson-Houston firm. Three boilers of the Brissoneau type are erected for the turbines, using forced draft for the furnaces. There will be two turbine-alternator groups erected when the plant is entirely finished, and each of these will contain a 1,000-kilowatt three-phase alternator working at 4,000 volts.

An extensive hydraulic plant is to be built on the Rhine at the locality of Istein and it will be operated in connection with a power-line network covering parts of Alsace and Baden. A company whose headquarters are at Mülhausen is engaged upon the project, and this is backed by the municipality and by Swiss and German capital.

Electric traction is to be used on the two sections of the Rjukan railroad in Norway which has been operating by steam up to the present. This line is of interest as it lies in the region of the great hydraulic plants of Rjukan and Svölgfos, and the current for operating the electric line is to be taken from these plants. Lake Tin lies in the path of the railroad and the two sections are connected by a ferryboat service, which covers the twenty miles distance across the lake. For the electric railroad there will be used 10,000 volts single phase, working at sixteen cycles. The first part of the outfit comprises three locomotives of 500 horsepower and two of 250 horsepower.

In the south of France there is being tested a new type of electric locomotive on the Paris-Lyons-Mediterranean railroad line in the region of Nice. The new locomotive runs upon 12,000-volt, single-phase current, and is designed by two engineers of the railroad company, Messrs. Auvert and Ferrand. So far the tests have been very successful with trains up to 250 tons. The locomotive differs much from the usual types, as it carries two rotary groups for rectifying the current. Thus the 12,000-volt alternating current taken from the line passes into a transformer and thence into the rotary converter of special design, which delivers direct current for the motors. By properly operating the converter circuits the starting and full-speed running of the locomotive are carried out under the best conditions and the inventors claim that in this way they secure all the advantages of alternating and direct-current working without their drawbacks.

Among the new German enterprises I note a new hydraulic plant to be erected near Lissberg, using the water of the Nidderbach and the Hillersbach. Instead of this, however, it may be decided to erect the plant on another stream near Wolfersheim. A trackless-trolley automobile line is now operating from Heilbronn to Böckingen on the Mercedes-Stoll system. The newly electrified Dessau-Bitterfeld standard-gauge section is commencing to run trial trains with the newly-designed electric locomotives. It is expected to obtain about 20,000 horsepower from a turbine station to be erected on the Ammer stream between Unterammergau and the Ammer Lake. Another project is the building of a large central station at Osterode, which is to work in connection with a power network.

Electrical matters are active in Sicily at present. A local company is now engaged on a project for using no less than 50,000 horsepower from hydrau-

lic plants. It is expected that the large sulphur industries will take current to the extent of 20,000 horsepower. At Syracuse there is a power network already in operation for the region. The Syracuse steam plant is run in connection with two hydraulic stations on the Cassabile and Alcantaro Rivers, using three different falls.

According to the most recent data, there are now running in Switzerland eight standard-gauge electric lines and thirty-six light railroads. Current is furnished to these by forty-nine hydraulic plants. To the standard-gauge lines will soon be added the Hötschberg railroad and the next in order will be the St. Gotthard line.

The Austrian telegraph department is making tests upon treating wood poles and expects to find a liquid which is better than the customary ones. It appears that fluoride of zinc gives very good results for impregnating the poles, according to the various trials which were made, and that it is superior to creosote or sulphate of copper.

At Bucharest, Roumania, there is being built an electric plant, which is located in the suburbs and is intended by the municipality to afford an increase in lighting current especially, so that gas is to be used to a less extent than heretofore for street lighting. Steam turbines are erected in the new station, using two 1,500-horsepower units, and it is intended to erect a third turbine set of a larger size.

A. DE COURCEY.

Paris, February 22, 1911.

Standardizing Electrics.

At the recent meeting of the Electric Vehicle Association of America, held at New York, an interesting paper was read by Alexander Churchward, of the New York Edison Company, entitled, "The Standardization of the Electric Vehicle." This paper treated especially the desirability of adopting a uniform voltage in storage batteries for vehicle service.

The discussion of the paper was led by John W. Lieb, Jr., of the New York Edison Company, Bruce Ford, of the Electric Storage Battery Company, and J. D. Forrer, of the Westinghouse Electric & Manufacturing Company.

Mr. Churchward held that standardization is almost a necessity in the face of the rapid development of the use of electric trucks, especially as to the number of cells, for these reasons:

"First—Because of the nation-wide interest being shown by all the central stations. It cannot be expected that a majority of central stations will go to the expense of providing facilities for charging at a great variety of voltages. Furthermore, the risk and trouble of changing or adjusting the charging range will not prove at all attractive, considering the small revenue derived, and the class of help employed, where a station is called on to do a general charging business.

"Second—That proper facilities for charging may be had at all public garages and the necessity of making it easy for these stations to obtain standardized charging equipment. It is to the central station that we must largely look to foster this industry and make the purchase and use of electric vehicles popular; therefore, we must seek to make their technical problem easy and the work attractive. Nothing will contribute more to this end than the adoption of standards of equipment and service wherever possible.

"Third—That a vehicle usually charged in a private garage while *en tour* may be charged at any other garage or central station.

"After looking over the electric-vehicle field," said Mr. Churchward, "especially on the commercial side, this does not seem to be a very difficult problem, but in the lighter commercial vehicles and a great many makes of pleasure vehicles there is a great variation. Not so much so, however, as there was a few years ago.

"A prominent company produced ten years ago a vehicle capable of running on ten cells or twenty volts; later this was increased to twelve cells and still later to fourteen cells. When they redesigned their cars a few years ago the lowest number of cells adopted was twenty-four, corresponding to forty-eight volts. This has now been increased to thirty cells, or sixty volts. The tendency all the time is to increase the number of cells and voltages.

"At the present time we have vehicles running in our cities with the following combination of cells:

Number of cells.	Maximum charging voltage required.	Number of cells.	Maximum charging voltage required.
Lead—		Lead—	
10	26	40	102
12	31	42	107
14	36	44	112
20	52		
24	62	Alkaline—	
27	70	40	72
28	72	50	90
30	77.5	60	108
32	82.5	62	112
36	92.5		

"The proposed standard in lead-battery cars is 30-40-42 cells, and in alkaline battery cars, 40-60-62 cells.

"It certainly would appear from the above table that the adoption of two charging voltages with a small amount of regulating resistance, and vehicles equipped with corresponding numbers of cells, would help simplify matters considerably."

Mr. Churchward then took up the influence of voltage on the efficiency of the motor and controller equipment, and with charts showed a very material loss in efficiency, caused by the internal resistance of motor, at once apparent in the reduced speed on grades. The internal resistance can at once be segregated, he claimed, into the copper loss (that is due to resistance of armature and field windings and the brush-contact loss between brushes and commutator. This latter loss becomes very great with the ordinary type of brush used as the voltage decreases and the current increases.

The only way to overcome this great loss, he held, is to use some kind of composite brush or better still a metalline brush. Why not use this brush at once on all motors and increase the efficiency all along the line? That would be easy if this special brush did not call for a special motor to go along with it. In other words, the commutation characteristics of the standard motor designed to use graphite brushes are not correct for a metalline brush, and the question at once arises, Will it pay to change the characteristics of the motors to use this brush, and if we do, will we not lose something else further down the line?

"My own impression is," concluded the speaker, "that we must increase the voltage and decrease the current within practical limits. If we can do this, the number of cells in all the various makes of vehicles of a given capacity will be the same. The number of plates, or the charging current, will be approximately the same for vehicles of the same size put on the market by different manufacturers.

"When you adopt one or more standard voltages, then the charging plugs, cables and resistances, etc., can be made to take care of all makes of vehicles; and you will give the central-station man a chance to get after customers and boost the electric vehicle for all he is worth."

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

ELEMENTS OF POWER-STATION DESIGN—XXVI.

TYPICAL STEAM POWER PLANTS.

BY W. B. GUMP.

It is convenient to divide the subject of steam power plants into two general divisions: the mechanical, or steam side, and the electrical side.

The mechanical side embraces:

(a) Engine and Turbine types.
(b) Steam Plant Auxiliaries.
(c) Condensers.
(d) Wet-Air *vs.* Dry-Air Systems.
(e) Cooling Towers.
(f) Water Purification.
(g) Foundations.
(h) Superstructure.
(k) Light and Ventilation.

The electrical side embraces:

(a_1) Switches and Bus Structures.
(b_1) Instrument Transformers.
(c_1) Power Transformers.
(d_1) Field Rheostats.
(e_1) Potential Regulators.
(f_1) Wiring and Cable Runs.

Engine and Turbine Types.—The first chapter outlined the general conditions which tend to separate the three methods of generating power; namely: hydraulic, steam and gas. The second method, that of steam power, was treated more at length under "The Selection of Prime Movers," in which the field of application of the steam engine and that of the turbine, respectively, were discussed. From facts therein contained a rather clear conception is formed regarding the proper installation of steam prime movers for a particular class of service.

Since the present chapter is to deal entirely with steam-electric plants, we may safely conclude that the typical steam-power plant which justifies units of 2,000 kilowatts capacity and above, is without exception a steam-turbine plant, while with unit capacities below this figure a large number of cases may justify the installation of reciprocating engines. Notwithstanding arguments to the contrary, the demands of electric-power service are such as to force the adoption of prime movers which are free from the serious objections now well recognized in connection with reciprocating units of large capacity.

The adoption of the reciprocating engine is thoroughly warranted in the great majority of pumping plants, and in a large number of factory power plants as well. The latter case, however, embraces units of comparatively small capacity. Present-day practice tends strongly toward larger units than were considered feasible a few years ago. On this account alone, a large number of plants are adopting the steam turbine where factors other than that of capacity contribute to economical steam-turbine performance.

Even though there are many advantages derived from the steam turbine, there are still some factors of uncertainty regarding it, and in small plants (of

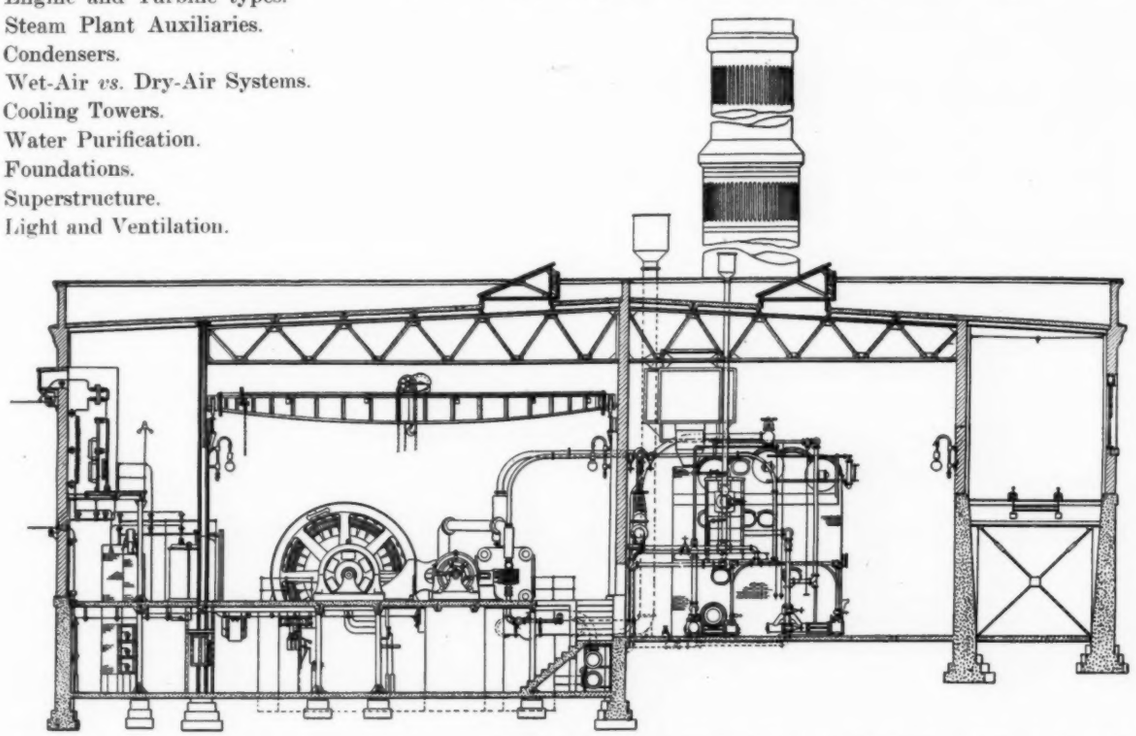


FIG. 1.—SECTION THROUGH POWER STATION OF INDIANAPOLIS, CRAWFORDSVILLE & WESTERN TRACTION COMPANY.

not over two or three units) where continuous service is paramount, the "old faithful" steam engine (Corliss or automatic cut-off) is not to be forsaken. This is a case where the "tried and true" outweighs all other elements, and the reciprocating engine is "unanimously" adopted.

The factor of uncertainty scarcely enters into a large turbine installation, for several reasons. One is, that closer attention is given the machinery, and another is that sufficient reserve capacity is available in case of an ordinary breakdown. It is evident that a turbine breakdown in a large plant is unlikely to interrupt service, from the fact that the proportion of reserve capacity to normal load is capable of taking care of an emergency to one or even two units. It is rare if ever, that more than two units become disabled simultaneously. The overload capacity of the remainder of the plant would then be available to keep up the load. This assumes of course, that four or more units are installed.

In describing plant types let us consider first Fig. 1, which shows the cross section of a typical engine plant. The arrangement of the boiler and engine room is that common to the majority of such plants and needs no special comment. The feature deserving probably the foremost consideration in this type, as well as in the turbine plant, is provision for future installations. Present practice strongly favors the "unit system" throughout. By the unit system is meant that each generating unit is made up of a combination of boiler unit, engine (or turbine) and generator, which combination affords complete isolation from the rest of the plant. In small plants this is not always justified. In large plants, however, the design should be made with the object of installing a unit system throughout.

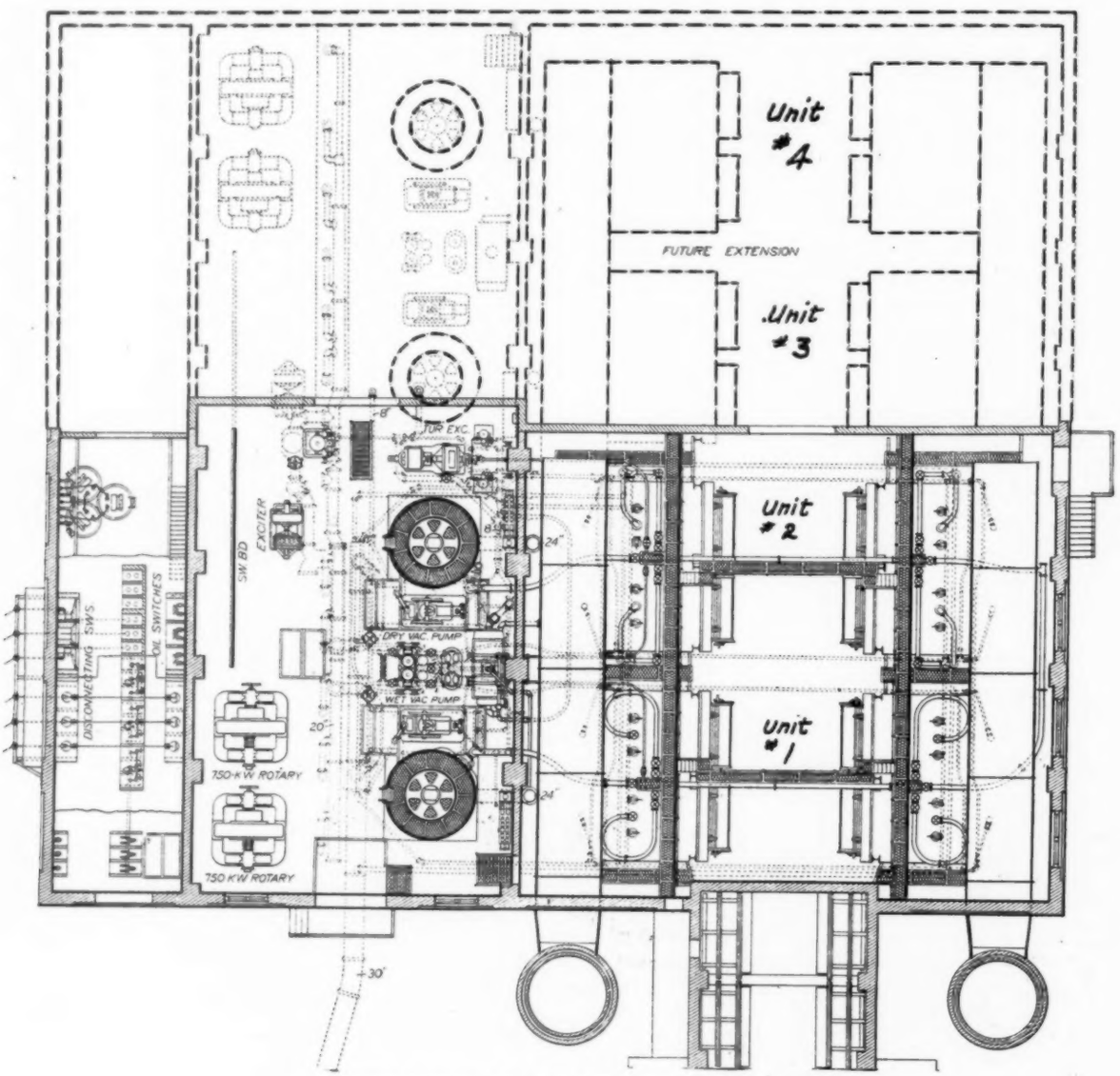


FIG. 2.—UNIT SYSTEM OF STEAM-TURBINE INSTALLATION.

In the arrangement shown it will generally be found that the chief difficulty is the spacing of engines and boilers in such a manner as to accommodate all appliances, so that neither the engines nor boilers become crowded or allow either to occupy undue space. The spacing of the engines is no great task. The arrangement of the boilers themselves is likewise simple. To combine these suit-

ably, however, is a problem which demands close study, and is one which if neglected usually incurs excessive cost and great inconvenience when future extensions are made.

In a small plant an equivalent of the unit system may be had by arranging the piping so as to afford interchangeability between any two or more boilers and the complete isolation of any boiler from the others, regardless of the number of settings.

Generally speaking, the division of a battery of boilers into units (of one or more single boilers) offers the same physical advantage on the steam side of the plant that isolated power loads offer on the electrical side. For example: consider briefly a plant supplying both railway and lighting service. The railway service is subject to heavy fluctuations while the lighting load is comparatively steady. The steam pressure will tend to fluctuate in accordance with the demands of service. Assuming that the steam side is combined, the influence of these fluctuations upon the entire boiler system, and hence upon the lighting service is more or less marked, depending to a large extent upon the relative load-factors of the lighting and railway service, respectively; that is, the ratio of the average railway load to lighting load.

The variation in steam pressure in a well designed boiler installation is not usually so serious as to justify continued segregation of the loads, especially with a turbine equipment, and there are advantages to be gained by combining the boilers. However, a unit layout offers a distinct advantage in a large plant from the facts that the operation of the plant is greatly simplified, and continuity of service is more certain.

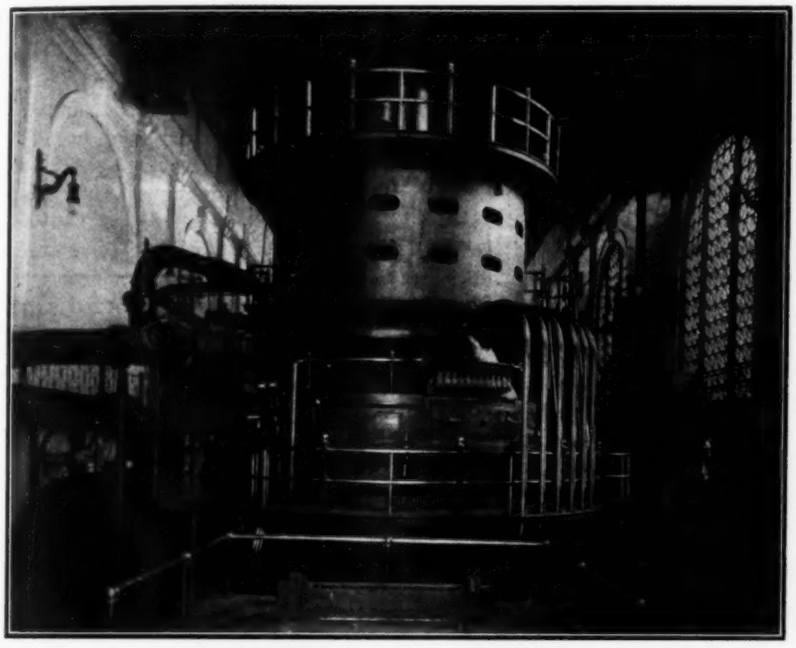


FIG. 3.—VERTICAL-TYPE STEAM TURBINE.

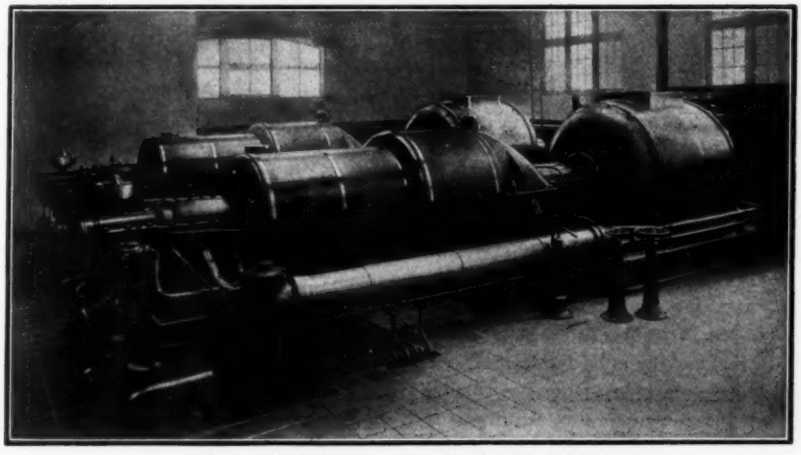


FIG. 4.—HORIZONTAL-TYPE STEAM TURBINE.

The plant shown in Fig. 2 may be considered a good example of the unit system. This is a steam-turbine installation having two units, and space reserved for two others. There are four double settings of boilers, to correspond to the existing turbo-units.

Fig. 3 shows the interior of a modern steam-turbine station in which the vertical type is installed. Fig. 4 shows a view of a horizontal-turbine installation. The resemblance to hydroelectric plants is somewhat striking in both installations, particularly the first. In either of these types the compactness of arrangement as well as the simplicity in the general lay-out is highly pleasing as well as economical.

Comparing these plants with a combination plant using both engines and turbines we have an impressive view of the case in Fig. 6. Here there are three steam generating units of which two are double compound engines and the third a vertical steam turbine. Each of the engines is rated at 5,000 kilowatts, while the turbine is of 5,500 kilowatts capacity. A study of this combination is a steam-plant object lesson long to be remembered.

Steam Plant Auxiliaries.—The boiler room has been treated at some length, and the general characteristics of prime movers have been dealt with. The matter of auxiliary apparatus was but partially taken up, and since it is of great importance, especially in connection with steam turbines, some of the details not previously pointed out deserve a place in this chapter.

Steam plant auxiliaries are in many instances slighted to the extent of permanently limiting the efficiency of plants which otherwise would be capable of high economy. In practically all plants, large or small, it is money earned to purchase first-class auxiliaries. The advent of the steam turbine early established the fact that high-class auxiliary apparatus is imperative if economy is to be realized. In this connection it may be stated that with large units the highest vacuum obtainable is almost invariably justified, since the efficiency drops rapidly as the vacuum decreases.

Condensers.—The cost of condensing apparatus is necessarily a vital issue, and when it comes to steam-turbine condensers the first cost is unfortunately much higher than for apparatus suitable to the average engine plant. A cost curve is shown in Fig. 5, being reproduced from a publication in *Power* several years ago in connection with an important article by J. R. Bibbins. It will be observed that for a vacuum of 27 inches (referred to 30 inches, barometer) the cost of condensing apparatus is increased twenty-five per cent above the cost of apparatus for a twenty-six-inch vacuum, while 28.5 inches doubles the cost.

The curve does not take into account the cost of additional space, more elaborate foundations, and the accompanying fixed charges, all of which naturally enter into the proposition. It should be noted, however, that with more costly apparatus the depreciation, and hence the upkeep, should be much lower than is the case with mediocre apparatus. Even if this were not so, the additional economy gained in steam consumption will more than balance the high first cost and fixed charges.

It cannot be disputed that the degree of vacuum best adapted to a particular plant has a definite relation to the yearly load-factor. The higher the average load, the greater is the length of time during which the condensing apparatus operates at a high efficiency. With a low average load the auxiliaries are operating at a low efficiency and consequently the cost of wasted energy added to the fixed charges increases accordingly. The fixed charges are constant irrespective of the load-factor, and since the losses are reduced in proportion to the increased load, a high load-factor reduces the cost per unit of power generated.

It is out of place here to discuss in detail the various condensers now in use. The choice of a condensing equipment is a matter depending upon so many factors that it is useless even to attempt to lay down a system of rules, except those which are applicable to general conditions, and may be considered as fundamental.

Jet Condensers.—Let us consider first the jet condenser. This type embraces all of those which allow the condensed steam and circulating water to mingle. They may be classified as: (1) Plain. (2) Siphon. (3) Ejector. (4) Barometric.

These are all used in connection with plants where a considerable quantity of cooling water is available, which may be rejected, or where the quantity is limited, and its recovery is feasible. The latter case refers more especially to plants in which a portion of the cooling water recovered is sent to the hot well, while the remainder is transferred to a tower or cooling pond to be re-circulated through the condenser.

Among the condensers above named the barometric type has found considerable favor, in turbine as well as reciprocating-engine installations. The barometric type affords means of securing a high vacuum, due mainly to its inherent construction. It is therefore better suited to steam-turbine plants than the other types of condensers, although there are accompanying objections as well. One of the objections is the large amount of head room required. In double-deck plants this is favorable rather than otherwise, and provides direct and simple connections between the turbine exhaust, and the hot well. It must be remembered that a water column thirty-four feet in height must be maintained; hence the head room below the turbine floor must conform to this requirement.

Surface Condensers.—Of the surface condensers ordinarily employed, the water-cooled type is by far the most common. Methods of air-cooling will not be treated in this discussion.

The employment of surface condensers is typical of power stations where the water contains a large amount of impurities, rendering it unfit for use in boilers, or where the quantity of water available for boiler use is limited. In many instances, no pure water is to be had without some method of purification, thus increasing both the first cost and the upkeep of auxiliary apparatus. Where the water supply is limited or is too expensive to be used from the mains of a city water-supply system, a cooling tower or cooling pond becomes necessary. Furthermore, the condition of circulating water is apt to cause more or less deterioration of the tubes of the condenser. In any case, frequent and regular cleansing is demanded.

From the facts just stated it is clear that the surface condenser is more costly both at the outset, and in maintenance, than the jet condenser. In spite of these objections its use is very extensive, especially in connection with steam-turbine installations. One reason for this is the fact that the aqueous vapor is more conveniently removed from a surface condenser than from the ordinary jet condenser, and consequently a higher vacuum is possible. However, certain types of jet condenser are admirably adapted to the production of a high vacuum, as will be seen later.

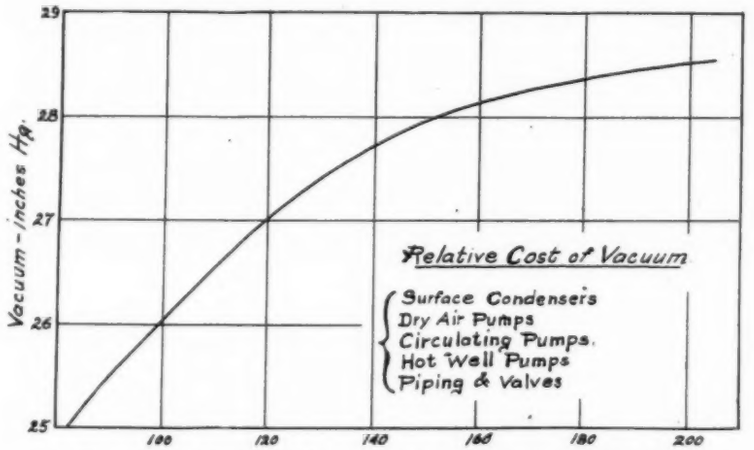


FIG. 5.—RELATIVE COSTS OF VARIOUS DEGREES OF VACUUM.

Wet-Air vs. Dry-Air Systems.—Until within a very few years a vacuum above 26 or 27 inches was not considered necessary, and the wet-air system was almost universal. The advent of the steam turbine brought about the necessity for extremely high vacua and has ushered in appliances capable of producing a vacuum close to twenty-nine inches.

While it is quite possible to secure high vacua with wet-air system (using plunger pumps to handle both the water and air) recent practice is strongly favoring the addition of a dry-air pump. Where steam turbines of not over 1,500 or 2,000 kilowatts normal rating are em-

ployed, the necessity for a dry-vacuum pump is somewhat questionable, since the cost of maintenance is proportionately large compared to the generated output. Here, again, the load-factor has an important bearing on the case.

The barometric condenser lends itself readily to the use of a dry-air pump, and since it is cheap to install and to maintain, it has become popular in steam-turbine plants, where a jet condenser is feasible. The other types of jet condenser are more compact and their construction is such that it becomes difficult in most cases to operate a dry-air pump satisfactorily, although this combination has been used. However, a condensing equipment for high vacua should generally be of a construction suited especially for a dry-air system.

An exception to the more common system of high vacua, (employing both a wet and a dry-air pump), is to be found in the Leblanc system, which is a radical departure from the usual construction, in that the air pump is rotary in its action, and entirely eliminates mechanical valves. The principle of action depends upon the centrifugal force of cold water which is ejected in the form of slugs from a series of buckets. The vacuum created directly behind the slugs of water entrains the air and vapor which is eliminated to the extent of securing a very high vacuum. Since the construction is greatly simplified in comparison to that of piston pumps, and the wear is accordingly small, this type is being strongly favored for steam-turbine plants. Fig. 7 illustrates the construction of the Leblanc condensing outfit, showing its use in combination with a Leblanc jet condenser. The air-pump portion is applicable also to surface condensers.

The operation of this apparatus is as follows: The exhaust steam entering at *A* strikes a jet of cold water at the spray nozzle *C* connected to the incoming pipe *B*. The condensed steam falls into the chamber *D*, flows into the centrifugal discharge pump *S*, and is discharged into the hot well. Connected to the top of the chamber *D* is a vertical air pipe *P*, through which the air, or condensable vapor is made to pass by means of a specially constructed centrifugal air-pump. The latter draws cold water from a cold well, having a sufficient head to keep the pump primed. The high rate at which the cold water "pistons" are ejected creates a suction in the air pipe which is claimed to be considerably higher than that produced by the movement of mechanical pistons.

(To be continued.)

[EDITOR'S NOTE.—This important series of articles was started in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, September 3, 1910, and before its conclusion will cover every phase of central-station design.]

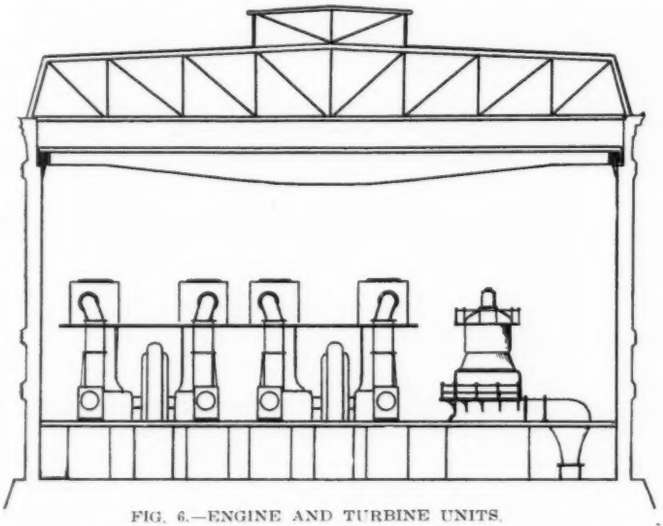


FIG. 6.—ENGINE AND TURBINE UNITS.

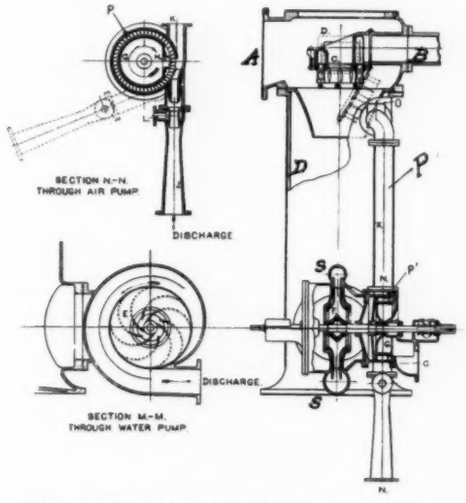


FIG. 7.—LEBLANC CONDENSER AND PUMP.

Use of X-Rays to Discover Pearls.

In a recent report Consul Albert Halstead, of Birmingham, England, states that Dr. J. Hall Edwards, of Birmingham, one of the British medical men who early devoted themselves to the use of the X-rays in surgery, delivered a lecture in London on X-rays and the important part they played in surgery. Speaking of other uses of these rays, he described their employment for the discovery of pearls. Instead of destroying the oyster to ascertain if it contains pearls, he declared that the rays might be used to show whether the oyster contained a pearl, and if nothing were discovered the oyster might be put back into the sea so as to continue to grow.

Chicago City Railway Company Places Big Order.

The Chicago City Railway Company has placed with the General Electric Company an order for $2,000,000 worth of railway equipment. This order, which includes complete equipment for nearly 1,000 cars, is the largest ever given to one concern.

New Cars for South Side Elevated, Chicago.

The South Side Elevated Railroad, Chicago, Ill., has recently placed in operation a new car which shows a marked improvement over the old cars used by this company, both in the general design and in the arrangements made for the health and convenience of the passengers.

Special attention has been given to the ventilation of the car and in this connection the arched roof was adopted as best suited for a sanitary interior. Four ventilators are installed in the roof of the car, each ventilator being fitted with a 12 by 14-inch operating register controlled from the end of the car. Five fresh-air intakes are provided under the heaters, each three inches square.

With this combination of ventilators and intakes it is possible to change the air every two minutes without causing a draft. In a recent test it was found that 45,000 cubic feet of fresh air could be brought into the car every hour.

ELECTRICAL Advertising *and* Selling

ELECTRICITY AS AN ADVERTISING MEDIUM.[1]

BY C. M. AXFORD.

The writer wishes, first, before taking up the subject of ornamental street lighting, to make a few remarks regarding opportunities for advertising through the medium of electrical signs.

There has been no lack of invention and improvement in electrical art. Thousands of men have labored successfully to cheapen, popularize and multiply the uses of electrical energy. To bring before the attention of each consumer ways and means and advantages for using current in display lighting, by the use of signs, etc., is one of the first duties of the commercial department of the central station.

How many miles upon miles of fences and signboards there are displaying advertisements only in the "daylight hours" that could be lighted at night with a few lamps and the advertiser would be reaping a benefit of twenty-four hours' advertising, rather than half of this period; furthermore, the advertisement would loom up more conspicuously by night than by day on account of the contrast.

It is necessary to investigate the demands and needs of the consumer and anticipate constantly what he wants and can buy advantageously. Many prospective consumers advertise in the local newspapers entirely, which would not be the case if they were to learn the advantages of advertising by means of electrical devices.

The impression left with the individual after a flashing sign display, is very lasting, due no doubt to after-image effect on the retina of the eye. Outline lighting affords another market for the sale of electrical energy and as an advertising medium the Mazda sign lamp has reduced the cost of this class of display lighting to approximately half.

Many central-station men recognize the possible result of outline lighting. The owners of imposing office buildings located short distances from the main center of cities should be approached and the business solicited for outlining the building with Mazda lamps. Then there would be a tendency to create a new center. A new business field is opened, electrical advertising will naturally follow these newly awakened communities and new business will be secured.

The value of this class of lighting should be easily recognized and every attempt made to secure such desirable business. An electrically lighted store or place of business can be made to stand out as prominently from its environments as does a mansion surrounded by dilapidated dwellings. It is merely a matter of judicious window and exterior lighting. Electric exterior lighting is not illumination, it is primarily advertising—first-class business booming publicity, which brings large returns for a comparatively small expenditure.

You recognize the up-to-date stores nowadays by the extent to which they employ electricity. Test that statement by counting the successful shops not using electric light.

The commercial field of a central-station company represents an opportunity to market a product. The act of supplying the demand and giving good service enhances the entire value of the community. As the community becomes more attractive through this advertising display lighting, it grows and develops, and as this change takes place the value of the market increases.

When one merchant realizes the great importance of electrical advertising and installs a sign, or other electrical advertising medium, the others follow his lead and install similar signs or display lighting, but the central station should not wait for the merchant, but be constantly on an inspection tour and study the consumer's individual needs and meet them with a proposition which will be advantageous to both.

ORNAMENTAL STREET LIGHTING.

The subject of ornamental street lighting can be treated in several ways and in many articles appear descriptions of various classes of special lighting which is more or less popular with many communities. As this is a subject which is not only interesting to the central station, but also to the merchant and boosters' association, the writer will attempt to treat it in both of its phases with greater detail from a central-station standpoint.

There is no question but that ornamental street lighting has a tendency to promote the interests of a community, improve local conditions, enhance real estate values, etc. The general appearance of a city is strikingly affected by the street illumination. The problem of obtaining economical lighting which is at the same time effective and attractive, is therefore of the greatest importance to every municipality and merits the careful consideration of every citizen and the central-station management.

In the majority of cities not provided with ornamental street-lighting systems, the campaigns for better street lighting were started by local merchants; the most successful examples, however, are found where there has been active co-operation between the merchant, municipal authorities and the central-station company.

Lighting companies should meet the merchants more than half way and assist them in selecting a system that will be applicable and one which will give the greatest illumination together with decorative effect. The cost of such a system is comparatively small when you pause to consider that the total expense is divided among so many individuals.

The tendency is for a higher standard of illumination still retaining the ornamental feature. As the tendency is for higher-candlepower light sources, there is a point I wish to bring out strongly in connection with their use, and that is, we must not neglect the detrimental effect of glare.

In order to obtain a uniformity of illumination on the street surface and prevent unpleasant glare from these units, they must be suspended a sufficient

1 Paper read before Wisconsin Electrical Association.

height from the street level and the glassware selected should be of such a character as to well diffuse and reduce the intrinsic brilliancy of the lamps.

The discernment of objects on the street is made easy providing the light sources are suspended a sufficient height from the street surface, so as to form the critical visual angle. The writer means by this that the lamps that are in the field of vision form an angle between the light source, the eye of the observer and the object viewed, of less than five degrees.

There are two effects of glare which are worthy of attention: (1) A measureable decrease in ability to see, due to the presence of a light source in to the field of vision. (2) A lessening chance of seeing a barely discernible object when viewed carelessly, except when by adjustment of the iris of the eye which is an involuntary strain.

Certain systems, although the light sources are ten to fifteen feet from the street level, provide a desirable ornamental lighting scheme, when, however, the standards are spaced close enough together and the lamps inclosed by some suitable diffusing medium as to give uniform lighting on the street surface.

If we were in possession of reports from the various communities which have installed ornamental lighting, we would have a history that would describe to us the progressiveness and the business booming of these various communities. It would show that wise business men make certain investments in electrical advertising which prove their progressive spirit and which contribute to a marked degree to the general welfare.

There is no doubt in my mind that these merchants and associations who install ornamental lighting in the various locations of the business streets are the ones who put real money in electrical advertising schemes that has given them tremendous returns. Those who have occasion to go to various cities and towns notice immediately the lack of that prosperous spirit of the busy citizen in the absence of ornamental street lighting.

When receiving a visitor in our homes, do we not arrange everything in order, make it cleanly, and home-like, so that such environment will make a pleasing and lasting impression? Likewise should not every citizen be proud to have his city made inviting to the visitor through such means as ornamental street lighting, outline lighting, display advertising and other electrical devices?

The illumination that is provided for every city by the municipal authorities is to a certain extent a close auxiliary to the police department, for the reason that more crime is committed in darkness than in daylight, and it should be the duty of every citizen and municipality to strive to obtain for their individual cities a street-lighting system employing the most applicable lighting unit which will give the greatest illumination, so that it will be the greatest assistance to the police department. There is no city official today who, with the interests and welfare of the city at heart and on his conscience, would not gladly consider a system of lighting that would cause the cessation of hold-ups, robberies, assaults, murders, porch-climbing, etc. This naturally presents the question—to what extent are our city officials responsible for the safety, convenience and protection of the public, beautifying of cities, and the encouragement of commercial growth? No self-respecting citizen should object to a tax-levy which would make it possible to have an illumination of his city sufficient to eliminate the shadows and dark places which are a menace to himself and members of his family.

SMALL VERSUS LARGE LIGHT SOURCES.

Just how much curb lighting interferes with sign lighting is a question which has not, up to this time, been investigated to any great extent. The writer has been unfavorably impressed by the location of many light sources, signs, window lights, etc., ten to fifteen feet above the sidewalk. Installed at these distances they tend to confuse the observer, and present a mass of lights that collectively mean so little, but separated as they should be, would mean so much.

There is one great advantage in installing signs twenty to twenty-five feet above the sidewalk, as it separates these electrical devices used for an advertising medium from some other advertising medium that is to be used for illuminating a thoroughfare. I am strongly of the opinion that if light sources were installed which gave a characteristic distribution of candlepower in the lower hemisphere and practically no light thrown above the lamp, such signs that appear above the street lamps would stand out beautifully clear and not be mixed with the curb lighting.

In lighting his windows the up-to-date merchant has learned many things which has been to his advantage; for instance he does not permit his light sources to be seen, but he hides them from view by some suitable curtain, drapery or translucent sign. Window lighting should be treated very similar to stage lightning. How many of us would enjoy a performance were we subjected to the glare of from 100 to 150 bare incandescent lamps? It is a question if we would see the play at all.

There are still many merchants who have not been convinced that their window lighting can be improved upon. These gentlemen must be taken in hand by the central-station men and shown where a few simple changes can effect a decided improvement.

In sections of certain cities where boosters associations are considering additional or original lighting schemes, and where the traction company has the right-of-way, a satisfactory plan is the use of special brackets on the trolley poles on each side of the street, (the poles already spaced unformly), and on these brackets suitable high-candlepower light sources.

There are many manufacturers who have desired ornamental posts, and many of the designs published are very decorative and can be obtained very reasonably. I am of the opinion, when special lighting is installed that a city should pass an ordinance making the posts selected the standard, and that no other style should be put upon the public street but the type approved by the citizens and the municipal authorities. This will prevent the installation of isolated standards of various designs, and will be a help to boosters' associations and merchants collectively, to install uniform, special lighting, rather than uniform individual lighting.

Toronto Automobile Show.

The Automobile Show held last week in Toronto included the first comprehensive exhibition of electric vehicles shown in Canada. This is due largely to the campaign inaugurated a year ago by the Toronto Electric Light Company, which resulted in the establishment of an agency by a large maker. The company quotes a special rate for this class of service and numerous inquiries have been made.

The exhibits included a chassis, a brougham and a victoria by the Baker Motor Vehicle Co.; a Lansden truck with Edison batteries and two coupés by the Canadian Vehicles Limited; storage batteries by the Edison Storage Battery Co.; Babcock Roadsters, coupés and victorias by the Gibson Electric Carriage Company; a coupé with iron-clad batteries by the Rauch and Lang Company; storage battery by the Tait Accumulator Company.

Electric Advertising Display By Airships.

The people of Berlin were very much surprised by a new and original form of New Year's congratulation in the form of an airship of the Parseval Air Transportation Company, which appeared on New Year's Eve over the metropolis and passed the main streets unusually close to the ground.

On each side of the huge bag were stretched large canvasses, on which appeared in great letters of light the words "Prosit Neujahr," meaning Happy New Year.

As the ship had just returned from its gas-charging station at Bitterfield, about 150 miles from Berlin, and displayed this lighting phenomenon for the first time, it caused a great sensation. The ship took its course to the Royal Castle, circumnavigated that and other important buildings and finally returned to its station at the town of Johannisthal.

The lighting is accomplished by an electric generator in the car, taking sufficient power from the airship motor to produce electric current for two search lights, one on each side. The outlines of the car are marked by incandescent lamps of various colors. This method of advertising is patented by the Air Transportation Company, Charlottenburg, Germany.

Enlightening Eighteen Million People.

The General Electric Company has published a handsome catalog entitled, "How the General Electric Company is Enlightening Eighteen Million People." This describes a wide-reaching advertising campaign which is being conducted by the General Electric Company.

The present census shows that our population has increased to 92,000,000. Not less than 45,000,000 people are located within reach of commercial electrical service. Cutting off families with incomes of less than $600 per annum, it is estimated that there are 18,000,000 prospects who need only a little enlightenment and a little urging to become central-station customers.

COVER DESIGN OF CATALOGUE.

Since September, 1909, millions of people have been reading about better and cheaper electric lighting and its advantages over other forms of artificial illumination. Twenty different well known magazines carried General Electric tungsten-lamp advertisements during the three fall months of 1909. Nineteen representative magazines carried tungsten and Mazda-lamp advertisements to 7,000,000 subscribers during the winter of 1909 and 1910. A series of seven advertisements appeared in a grand total of 11,487,000 copies of well known national weeklies like the *Saturday Evening Post*, *Collier's*, and the Associated and Illustrated Sunday Magazines.

This campaign has been extended to store and business trade papers, industrial trade papers, popular magazines and electrical trade papers. The advertising is of a varied character, is cleverly written, and attractively illustrated. This advertising is of direct benefit and is available to every central station in the country. Hundreds of companies in all parts of the country have availed themselves of this offer of co-operation.

SAMPLES OF ADVERTISEMENTS APPEARING IN TRADE JOURNALS.

SAMPLES OF BOOKLETS, ENVELOPES, ETC.

A GROUP OF ELECTROTYPED NEWSPAPER ADVERTISEMENTS.

Electric Iron Campaign.

The Denver Gas & Electric Company is distributing an attractive folder setting forth a number of the advantages of the electric iron.

Residence-Lighting Campaign.

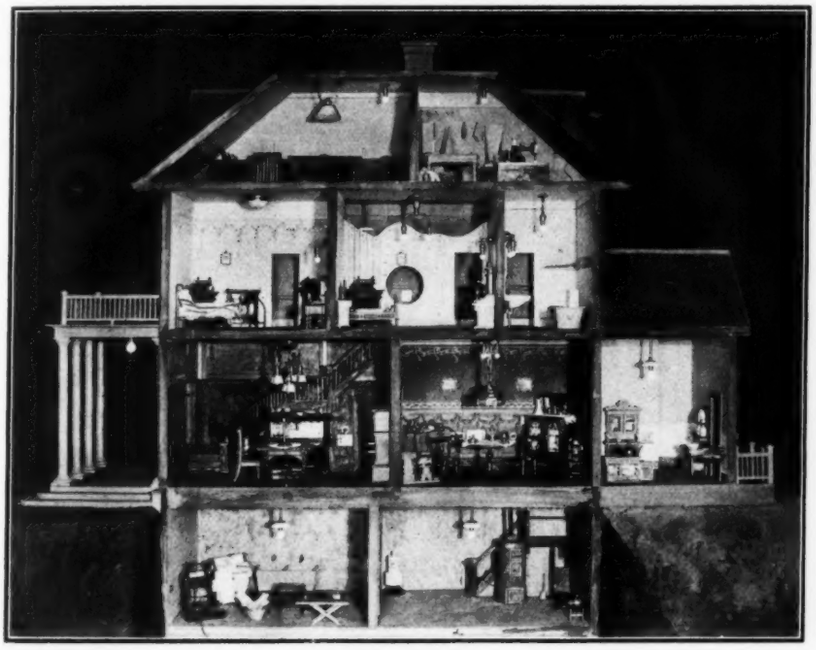
In planning the home one of the most important questions to be considered is illumination, both natural and artificial. Due consideration therefore should be given the arrangement and size of windows; it is highly important, in the interest of the family's health and cheerfulness, that in the evening the home should be well lighted.

Electricity is imperative to the advancement of modern home life. It is largely responsible for the degree of success attained by cities and the comfort of citizens. It is, therefore, of the utmost importance that a city should be well lighted, but to be well lighted each individual home should have the proper illumination.

The proper planning of a well lighted home rests in the true conception of what modern science calls efficient illumination, and a clear understanding of the essential factors necessary to produce artistic effect, having constantly in mind economy.

In carrying on a residence-lighting campaign in Minneapolis, Minn., the Minneapolis General Electric Company has been distributing attractive booklets containing floor plans and lighting arrangements for a number of different six-room cottages, showing the proper arrangement of lighting fixtures, switches, windows, etc.

In furtherance of this plan of showing its customers and prospective customers how an installation should be made to be economical and at the same time artistic the Company had on exhibition at the recent Minneapolis show a model home, shown herewith, wired and arranged according to the best practice. While built on a small scale every detail, including outlets, switches, etc., was given careful consideration and the demonstrators were able to demonstrate convincingly the advantages of electricity in the home. The installation was shown in actual operation and proved of great benefit to the company.



MODEL COTTAGE COMPLETELY WIRED, DEMONSTRATING THE PROPER METHOD OF WIRING.

Value of Electrical Advertising.

One trenchant reason for the effectiveness of electric advertising is the fact that light possesses great advertising value. The term "electric advertising" may be taken to include all forms of publicity in which light is a predominant factor, furnishing illumination for attracting attention or for the display of goods or an announcement. It begins with the electric sign over the door and takes in the decorative outlining, the illuminated window display, interior lighting, etc.

The electric sign, the father of electric advertising, is the forerunner in this field. It has been the experience of electric light companies and of electric advertising experts that after the overhanging electric sign is in place the merchant or advertiser is then ready to use electric publicity in other forms.

The electric sign prompts travel. Travel brings with it the necessity for other forms of display advertising; rather, brings the opportunity to make display advertising most effective. Then the merchant feels the necessity of dressing his windows artistically and lighting them well. This is all electric advertising and comes within the scope of the advertising expert's work.

There can be no disagreement as to the value of outside display advertising. It is extremely desirable from every standpoint. People will not travel dark streets—not necessarily from a sense of fear, but it is natural for every animate being to be attracted by light.

The great beauty about electric advertising is the fact that it adapts itself so admirably to the financial condition of the merchant. The pioneer merchant must necessarily first utilize that form of it which brings him the greatest returns and prominence for each dollar expended. This initial form of display is the electric sign which can be read from a distance.

A few overhanging signs in a locality induce more travel, more travel induces the merchant to use additional forms of display advertising. You never saw a merchant willingly discontinue any form of electric advertising after he had used it for a while and experienced its good results. Electric advertising acts directly upon sales and stimulates the cash register.

When promoters of expositions want to attract the attention of the world, they do not rely upon artistic boulevards and symmetrically arranged parks. They turn on the lights; they use light, and lots of it. Our cities are commercial centers. They must necessarily drift commercialward in sentiment and appearance. They are expositions of business and must have light. The best lighted cities today are the most progressive.—*Signs of the Times.*

New Sign for Chicago.

The Commonwealth Edison Company, Chicago, has closed a contract with the new Columbia Theater for current for lighting the spectacular sign recently installed by the theater. The sign is equipped with 2,000 tungsten-filament lamps.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

LIGHTING A BREAKFAST-FOOD FACTORY.

BY ROSCOE SCOTT.

An important class of industrial lighting problems is interlinked with that large, important and typically American industry, the manufacture of cereal products for the breakfast table.

Granting the importance of the industry, taken as a whole, it must be admitted that it is split up into so many divisions that the illumination conditions to be met in any one factory differ from those in nearly all others. Meals, flakes, biscuit, popped berries, granules and so forth, each require different lines of machinery for their manufacture and each of course has its own lighting problems. One important general requirement, however, affecting the choice of illuminants, holds throughout, namely, the requirement of purity. Many firms boast of the fact that their product is touched by human hands but once or twice from the time the grain is received at the factory until it reaches the consumer. With such precaution against contamination, it is but natural to find that the large breakfast-food factories at Niagara Falls, Battle Creek, and elsewhere, use the hermetically sealed incandescent lamp exclusively as a factory iluminant, thus eliminating all possibility of smoke or soot from the lights reaching the food.

The Kellogg Toasted Corn Flake Company, of Battle Creek, Mich., not long ago remodelled its factory lighting system in accordance with suggestions and assistance given by the Fostoria Incandescent Lamp Company. The general conditions existing at the plant are as follows:

Electrical energy is generated on the premises, the prime movers being two 750-horsepower Corliss engines and one low-pressure exhaust turbine, the latter directly connected to a 450-kilowatt generator. With this economical plant, the cost of current supplied to the lamps is only about one and one-third cents per kilowatt-hour. During nearly fifty per cent of its working hours, the plant has to be illuminated by artificial light, since in order to keep production ahead of demand it is found necessary to work twenty hours out of the twenty-four, six days a week. The output averages 4,160 cases of corn flakes per day, thirty-six packages to the case.

A factory of this kind is not a place where fragile lamps can safely be installed unless proper precautions be taken. Some parts of the building are subject to severe vibration and heavy jarring, which is most pronounced in the engine room and in the packing room.

FIG. 1.—ENGINE ROOM, SHOWING NEW AND OLD METHODS OF SUSPENDING LIGHTING UNITS.

All the incandescent lamps used were of the carbon-filament class when, in March, 1910, the company decided to change to metal-filament lamps as a means of illumination. The units, which vary in size from 20 to 100 watts, are protected by jar absorbers of the stretched-spring variety, the springs being strong enough to carry their load with a considerable factor of safety.

The package room is 60 by 100 feet, ceiling 9 feet high. It is lighted with seventeen sixty-watt and three 100-watt clear Mazda lamps, fitted with Holophane steel reflectors, some of which give an extensive and others an intensive distribution, as required.

There is no symmetrical arrangement of lamps in this room, but they are placed over the various machines and benches so as to secure the best illumination for the operators to work by. The lighting is a compromise between the "general" and "specific" systems of illumination, and it is found possible in this particular case to obtain entirely satisfactory results with the extremely low consumption of 0.22 watt per square foot of floor area.

The flaking or roll room is 60 by 117 feet, and such general illumination as is found necessary is given by four 100-watt clear Mazda lamps, equipped with flat metal reflectors. In addition there are thirty-two ordinary sixty-watt carbon lamps on drop cords; these have to be used to a certain extent as portables, for the inspection of the various machines, and are protected by wire guards.

The engine room, the dimensions of which are 44 by 65 feet, is lighted by eighteen sixty-watt clear Mazda lamps,

fitted with extensive Holophane glass reflectors. Six posts made of iron pipe each carry a three-arm top from which the lamps are suspended by springs which protect them from the excessive vibration, which is very pronounced in this particular room. The former method of lighting (see Fig. 1) employed a large number of four-light clusters of carbon lamps, suspended from the roof beams. The new method brings the light-sources nearer to the machinery, and makes them much more accessible for cleaning and renewals.

An idea of the illumination in the factory may be obtained from Fig. 2, showing one of the packing machines. The photograph, taken by the light of the metal-filament lamps only, indicates very clearly how the luminous flux is directed downward upon the machines and how little of it is wasted by absorption above the working level. It will be noted, incidentally, that the room has large windows, permitting a generous influx of daylight, while daylight is available.

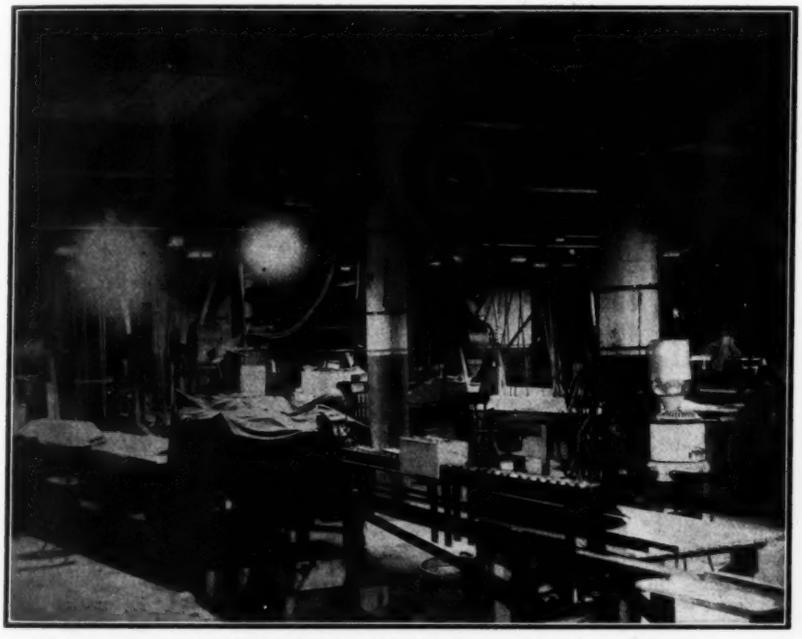


FIG. 2.—ILLUMINATION OF ONE OF THE PACKING MACHINES.

The average intensity of artificial illumination at the working level throughout the factory has been practically doubled by the installing of the metal-filament lamps, and at the same time the power consumption has been reduced to about half its original value of 75 to 100 kilowatts.

Nowhere, perhaps, are the energy-saving possibilities of metal-filament lamps more forcibly brought out, by contrast between old and new methods, than in electric sign lighting. This is on account of the fact that the carbon lamps formerly used were of exceptionally low efficiency, usually about five-watts per candle, whereas the low-voltage metal-filament lamps that are commonly used to replace them have an efficiency of 1.3 watts per candle, or better. Thus the consumption per lamp may easily be reduced from twenty to five watts. This apparent digression leads to the consideration of the saving which the Kellogg Company has made by remodelling a large electric sign, formerly equipped with 500 four-candlepower, twenty-watt carbon lamps in natural-ruby, leaf-green and frosted bulbs. The superseding equipment employs 300 four-candlepower, five-watt, natural-colored Mazda sign lamps, these consuming a total of 1,500 watts as against 10,000 watts for the old equipment. The consequent saving of 8.5 kilowatts on this one sign which is lighted, on the average, six hours per night, would pay for the extra cost of the new lamps, and of adapting the sign to low-voltage lamps, in short order. The energy saving per night is fifty-one kilowatt-hours, and figuring on the conservative basis of 1.3 cents per kilowatt-hour, the pecuniary saving is found to be sixty-six cents per night.

The principal proof of the satisfaction with which the proprietors of this breakfast-food factory view their up-to-date system of lighting is found in the fact that they are now equipping a five-story addition, containing 45,000 square feet of floor area, in the same manner.

Organization of County Light Section at Pittsburg.

At a banquet to the employees of the Allegheny County Light Company given by its officers at Hotel Duquesne, Pittsburg, on February 28, a section of the National Electric Light Association was formed, to be known as the County Light Section, and approximately 150 of the employees joined the section. Prior to this time about thirty-five of the employees were already Class B members and therefore the section started with 185.

H. N. Muller, superintendent of distribution of the Allegheny County Light Company, acted as temporary chairman; W. H. Donkin, general contracting agent of the same company, acted as temporary secretary and James M. Graves as temporary treasurer.

H. H. Scott, chairman of the Membership Committee of the National Electric Light Association, gave a history of the organization, told of its growth and the objects for which the Association was striving.

A. R. Granger, of Chester, Pa., president of Pennsylvania Electrical Association, followed Mr. Scott and told of the work the company sections were doing, particularly the Philadelphia Section, and also dwelt on the work of the Pennsylvania Association.

R. S. Orr, W. A. Donkin and F. Uhlenhaut also spoke briefly and pledged their best efforts to make this section a success.

Electric Lighting Replacing Swiss Candles.

Owing to abundant water power, the use of electricity, even in small villages and on farms, is greatly increasing throughout Switzerland. The use of candles is therefore gradually decreasing. Heretofore the candle has been the general illuminant in the small Swiss homes. There are still about 2,000,000 pounds of candles produced in the Swiss candle factories every year. Cheap electricity is, however, producing a sudden change from the primitive to the modern mode of lighting.

TELEPHONY—TELEGRAPHY, and WIRELESS.

New System of Multiplex Telegraphy.

Experiments have been just completed at Florence, Italy, before a large number of experts, with a new apparatus for multiplex telegraphy. The apparatus is the invention of Corrado Andraini, a well-known Italian engineer, and was constructed by Louis Maino, the chief of the technical bureau of the Italian state telephone deparment. The Morse alphabet is used, and it is possible, according to the London *Daily News*, to send more than ten telegrams by one line at the same time. Each touch of the operator causes a blade to vibrate, which is tuned to a certain sound, and this transmits to the line alternating currents of high power and of known and invariable periods. The currents transmitted by the blades "disconnect themselves at the receiving station, and by means of special mechanism associate themselves with different Morse instruments." According to the length of the sounds transmitted by the transmitting office the Morse operator marks dots and lines. With the new system it is possible to transmit ten to fifteen telegrams at the same time, whereas at present only thirty to forty telegrams per hour can be sent on a single wire. The adoption of the new apparatus necessitates very slight alterations in existing instruments, and the extra installation is inexpensive.

Wireless on Submarines.

The experiments with wireless telephone and telegraph apparatus at Cherbourg in connection with submarines have, it is announced, proved completely successful. Four submarines attached to the battleship *Bouvines* first proceeded to make experiment with the submarine bell telephone, and then left the bay where the *Bouvines* was anchored, and kept in telephonic as well as telegraphic communication with her by means of wireless. The submarine was able to communicate to the battleship the name of every ship it met out at sea.—*Electrical Engineering.*

New Signal Installations on the Santa Fe.

The accompanying illustrations give a good idea of the physical appearance of a new signal installation which has been made on the lines of the Atchison, Topeka & Santa Fe Railroad, between Los Angeles and Garvanza, Cal. These signals were placed in service about the middle of November, and the photographs have just become available. The installation covers four miles of single track, and the signal system consists of twelve three-position upper-quadrant style "S" Union Switch & Signal Company's signals. This is the first installation of three-position upper-quadrant signals on the Santa Fe Coast Lines and every effort has been made to bring every detail up to the highest standard of construction. The work was in charge of construction foreman R. A. Mathews, directly under the supervision of division signal foreman J. W. Metcalf.

Primary batteries are used for the operation of the signals and line control relays. Sixteen cells of battery are used for the signals, these cells delivering about sixteen volts. Concrete battery boxes and stub poles are used. The mild climate of this section of the country makes it possible to use concrete battery boxes instead of wells, cheapening the construction, and as the batteries are brought close to the surface they are made more readily accessible for attention. The track circuit is supplied by three cells of gravity battery connected in multiple. Fig. 1 shows the signal at a "clear" position, and Fig. 2 and Fig. 10 show the signal at "caution." Fig. 4 shows a view of an east-bound home signal and the interlocking tower. Indicators are placed in the tower which give the towerman information regarding the location of trains and the track sections which have occupancy. Fig. 5 shows the concrete stub pole with the switch indicator attached. All line wires enter the concrete stub pole at the apex through type "F-51" condulet, and loricated conduit to a lightning arrester box and from the arrester box the wires are distributed to the proper terminal studs. Two-position switch indicators are used at all switches leading from the main line. These indicators give indication in the upper right-hand quadrant. Fig. 8 shows one of these indicators. Fig. 7 shows a single concrete battery box made in connection with a signal foundation and Fig. 6 shows a double battery box. In all cases loricated conduit is used for running wires between signals and battery boxes. The installation runs through the city and there are a great many crossing bells entering the circuits, adding very much to the complication of the system. The installation passes through one mechanical interlocking plant at the Southern Pacific Railway crossing. The old mechanical wood pole signals have been superseded by power-operated style "S" signals. Approach and detector locking has been provided and Model 3 electric locks and screw releases have been installed.

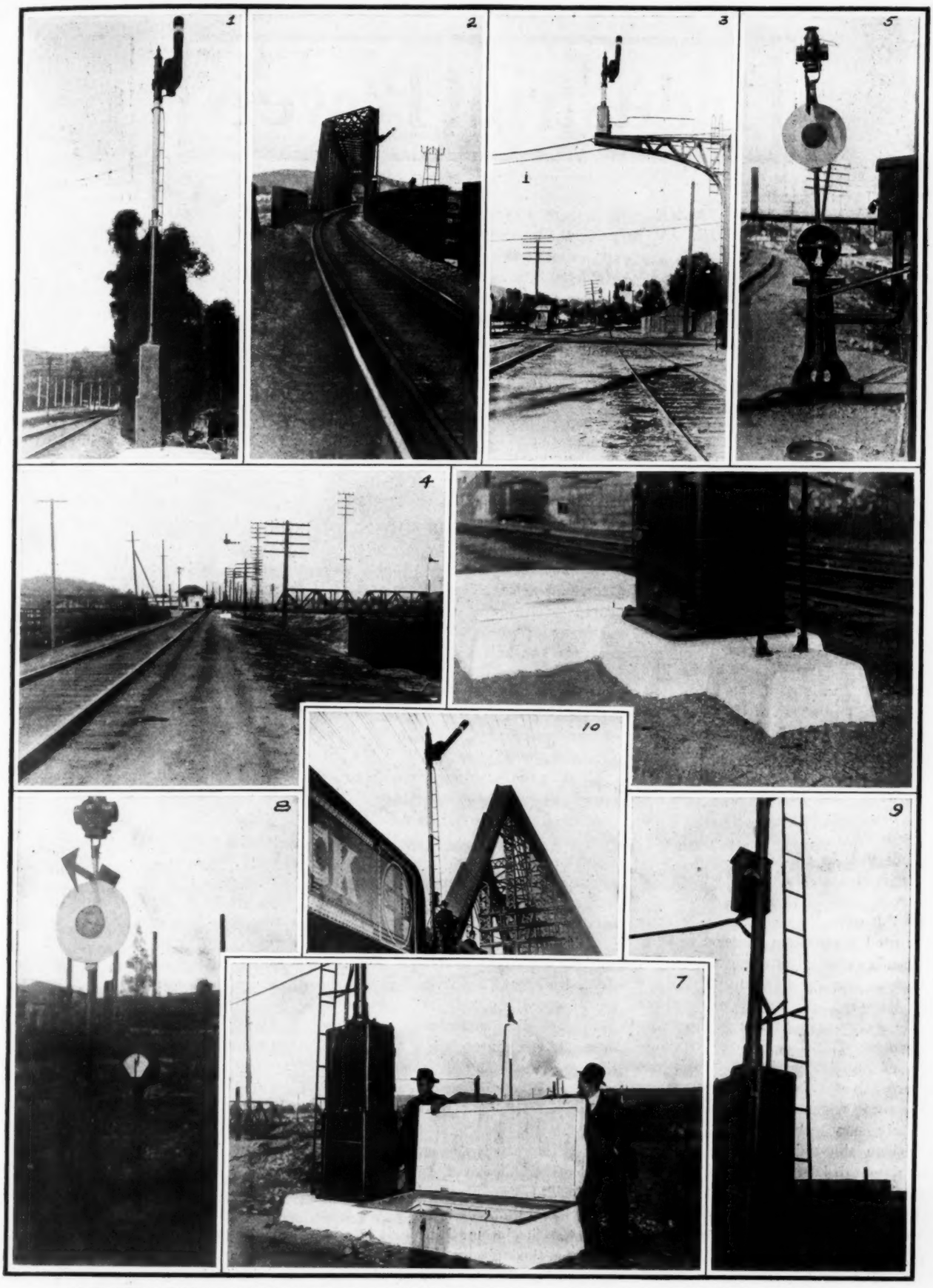
We are indebted to H. J. McKinley, chief draftsman in the signal engineer's office at Los Angeles, for the information and photographs here presented.

Proposed Telephone Law.

A bill has been introduced in the Assembly of New York State providing that each telephone company shall, upon the demand of its subscribers, render monthly statements to each person using the service. The statement will include the number of messages used with the telephone numbers of all persons called during the month.

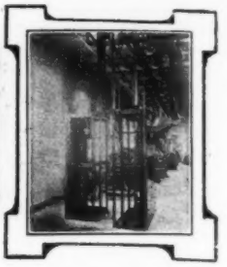
Wireless Stations in India.

Wireless telegraph stations are to be erected at Calcutta, Delhi, Allahabad and Simla, in Hindustan, by the Marconi Wireless Telegraph Company. The range of the three former will be 600 miles and of that at Simla 300.



NEW SIGNAL INSTALLATION ON SANTA FE SYSTEM BETWEEN L OS ANGELES AND GARVANZA, CALIFORNIA.

Industrial Power



MODERN TENDENCIES IN TRUNK-LINE ELECTRIFICATION.[1]

BY C. L. DE MURALT.

In this paper I propose showing how certain features of modern electric-railroad equipment have developed during the past few years and how they are likely to further develop in the future.

First, we will take up the connection between motor and driven axle. In the first electric cars the motors were geared to the axle. Later, as motors grew larger and larger, gears began to be troublesome. Motors were then direct-connected to the axle. The New York Central locomotive is possibly the highest development in this line. The motor armature is mounted directly on the axle, the fields are part of the locomotive frame. This relieves the truck of the weight of the fields, but gives it the full effect of the weight of the armature. Locomotives of this kind are rather severe on the track. The endeavor then must be to relieve the axles of the armature weight as well. That can only be done if the whole motor is lifted off the shaft and a connecting link is added between motor and driven axle. This introduces the side rod.

In European locomotives, side rods were used years ago. In America they have only come into use quite recently, American engineers fearing that there would be bad effects similar to those of the reciprocating parts of the steam locomotive. But the motion of the side rods of an electric locomotive is not reciprocating in character at all. It is a truly rotating motion which can be accurately counterbalanced. The first American side-rod locomotive was an experimental locomotive built by the General Electric Company. The latest Pennsylvania locomotives built by the Westinghouse Company are very similar in many ways. Both place the motors on the locomotive floor where their entire weight is spring-supported, and both drive by means of an inclined connecting rod to a counter shaft and from there by means of side rods to the driving axles. Whether or not the inclined rod will show up difficulties in prolonged operation remains to be seen. Europeans in general do not consider this inclined rod very advantageous. The latest Simplon locomotives have the motors placed considerably above the driving axles but not quite as high as in these American locomotives. Two motors are placed near the center of the locomotive between the center pair of driving axles. The motors are connected by means of an X-shaped connecting rod, which not only interconnects the two halves of the locomotive, but at the same time lowers the point of drive so that the side rods going to the crank pins on the driving wheels assume practically a horizontal position.

What is the advantage of side rods? There are two main advantages. The first one has already been pointed out. The axles are relieved of the heavy weight of the motors, the latter being spring-supported from the locomotive frame. The second advantage lies in the fact that the center of gravity of the locomotive is raised. When electric locomotives were first designd it was considered a great advantage that the center of gravity could be placed low. There are disadvantages to this, however. If the center is low the locomotive does not tend to lean over in curves. When it strikes a curve it strikes it with full force and this is hard on the rails. If the center of gravity is raised, the stability of the locomotive is lowered, to be true, but the hard action of the locomotive on the rails in curves is relieved to a great extent. The locomotive may sway but it passes through curves with a certain ease. The advantages of the low center of gravity are therefore gradually being given up in favor of easy-riding qualities. Unfortunately this seems to be overdone just at present. It is being carried needlessly far and some present designers actually place the center of gravity as high or higher than in a steam locomotive. It is not apparent yet that the electric locomotive must have such a high center of gravity.

The exact relations existing between best height and best riding qualities have not as yet been established to my knowledge. But anyone who tries the various locomotives will find that the Giovi and the latest Simplon locomotives, for instance, ride easier than those of extremely high center of gravity. They strike the curves easily and yet they do not lean over very much. It remains for someone to investigate and establish just which height will be the best. So much about side rods. I believe they will come more and more into favor. The locomotives of the future may possibly even profit by the use of a combination of gears and side rods, using a high-speed motor on the locomotive floor to drive by means of gearing a countershaft from which the drivers receive their power through side rods.

As regards current-collecting devices, there is also a change going on which is worth while noting. The familiar trolley wheel has been standard practice in America for a long while. In Europe they have always used both trolley wheel and bow collector. The latter has come into favor in this country for high-speed roads, for the reason that a trolley wheel at high speeds is liable to leave the wire, whereas the bow is not subject to this trouble. The original bow is pressed against the wire by means of a spring using a point near the roof of the car as a fulcrum. Instead of this a pantagraph is sometimes used. Both are open to objections, because there is too much weight in the moving parts. Every low

1 Paper read at a meeting of Detroit-Ann Arbor Section, American Institute of Electrical Engineers, February 18, 1911.

spot in the line will throw the collector off and it will come back and strike the wire with a force proportionate to the inertia of the moving parts. Reduce the weight of the bow and the blow will also be reduced. The tendency should therefore be to make the collecting device as light as possible. In Europe they secure this by dividing it into two parts. The main part is semi-fixed and is raised or lowered by the motorman according to the general condition of the wire. Under a bridge, for instance, it is lowered. On top of the main part is the short actual-contact device. This moves on top of the main part very much as the old device used to move on top of the roof. Thus the part which follows the inequalities of the trolley wire is very light. The design is evidently a move in the right direction. It can be adapted either to trolley pole or to pantagraph. The future is likely to see this idea carried out in this country as well.

As regards the contact wire itself, overhead lines have plainly been built too heavy. The New Haven installation is an extreme in this respect. The lighter the line can be made, the cheaper. In trunk-line service the line cost is a great part of the total cost of electrification. It is therefore highly important to reduce this cost as much as possible. The Simplon three-phase installation in Switzerland uses very light gas-pipe supports. A similar construction has been adopted on the Giovi line in Italy. There is absolutely no reason why lines should not be built as light as this in America. The sooner it is done the better. It will make electrification much more acceptable to the railroad man, because it will remove the tremendous line expense with which he is now confronted.

A word about motive power. Ever since the beginning of trunk-line electrification there has been a regular fight among manufacturers as to which system of motor should be used. The effect of this was that steam-railroad men were confused and this has doubtless held up the natural progress of electrification. Fortunately a new way of looking at things is coming into vogue. Every system has its good points and should be used in its proper place. We cannot possibly use one system alone. It would be like trying to use one kind of steam locomotive for all classes of work.

This movement is going to get a greater share of attention in the future for the three-phase motor. It is by far the most simple and rugged of all electric motors. It is also the only one of the present motors which has a constant-speed characteristic. This is an important factor and it works as follows: the draw-bar characteristic of a steam locomotive is of a drooping nature. Due to the limited boiler capacity, the draw-bar pull falls off as the speed rises. The ordinary series-type electric locomotive maintains the starting draw-bar pull up to a considerably higher speed. Thus it already presents a great advantage over the steam locomotive. From a certain point on, however, the draw-bar pull falls off and continues to fall due to the inherent increase in strength of motor field. The three-phase locomotive has no falling off in draw-bar pull. It carries the maximum draw-bar pull from start to maximum speed. This schedule speed can be maintained by a three-phase locomotive under all conditions.

The Great Northern has the first three-phase installation in America. It is an encouraging sign and shows that at least someone was willing to try this system under American conditions. If the present tendency keeps up, it is to be hoped that all three systems will get the same show and we shall then soon have a very strong tendency to use electricity extensively as motive power for trunk lines.

You will have noticed that I have drawn freely on European practice. The fact is that Europeans can teach us a lot in trunk-line electrification. They have not built as large installations as we, but they have worked out the details much more carefully. They have not standardized before the art was sufficiently developed. Each installation of theirs represents a real progress.

Some people say it is wrong to copy European designs. I agree that it is wrong to simply copy them. They should be applied with care to American conditions. But we certainly should take notice of them.

In the discussion which followed, Mr. Hall stated that experience at the St. Clair Tunnel is that the wear on the trolley wire is very slight. With a galvanized steel shoe the wire will wear about sixteen years. It is a No. 0000 wire. This is with the provision that the shoe is kept well greased.

As regards the wear on the rail due to the low center of gravity, no particular difficulty is found with the rails, but it is with the flanges. The wheel tires do not wear appreciably, and the wheels are not taken down due to the tread wearing. The flange wear, however, is rather abnormal. After ten months' operation, or about 80,000 miles, new flanges must be put on. This is rather expensive due to labor and loss of tires. Without this, tires would last six years, but now five-sixteenths inch of good tire must be cut off to get a good flange.

The steel shoe gives a life of about 3,000 miles. A winter tension of seven pounds and a summer tension of three pounds is used.

Electrical Equipment of a Mexican Reduction Mill.

The great ore-reduction mill of the Alvarado Mining and Milling Company which has just been finished at Parral, Mex., and which was erected at a cost of $1,000,000, is said to have one of the most complete electric power plants and equipment of any mill in Mexico.

The electrical apparatus consists of the following: three three-phase 480-volt, 300-ampere, sixty-cycle revolving-field generators and one 480-volt, 600-ampere, sixty-cycle generator of the same type. Each of these generators is capable of standing a temporary overload of twenty-five per cent for a limited time thereby increasing the normal output of the station should the occasion arise. All generators are so connected as to make it possible to operate singly or in parallel. This method permits the entire energy of the several generators to be transmitted over one or more circuits. By means of a synchronoscope located on the switchboard the generator may be brought into or taken from service without interrupting the operation of the mill at any time. With this flexible method the mill can operate continuously.

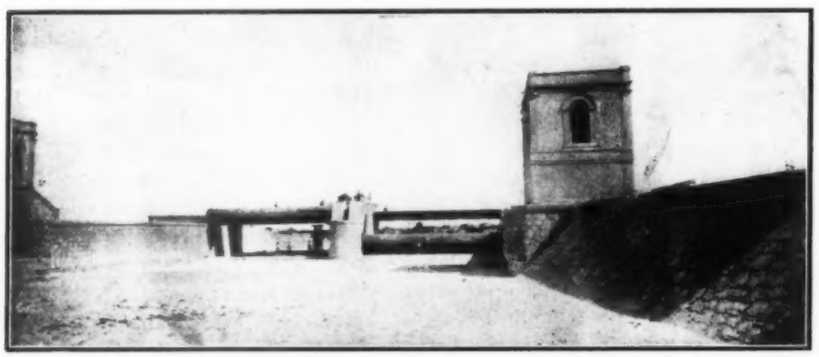
Each generator is equipped with its own exciter, but arrangements and connections have been so constructed on the switchboard that all exciters may be operated in multiple, thereby insuring a permanent exciting current should an accident occur to any of the several exciters.

The power station is connected to the

mill, some several hundred feet away, by two circuits connected in multiple of 900,000-circular-mil cable, and to the Palmilla mine through a step-up transformer station where the voltage is transformed from a primary voltage of 400 to a secondary of 2,300 volts which is transmitted over a solid wire. At the mine the current enters a step-down transformer where it is again transformed to 480 volts for use in the mine motors.

Electrically Lifted Dams.

Great steel cylinders, that are lifted and lowered by means of electric power, are being used to form water-storage reservoirs and to govern the flow for irrigation purposes in the Laguna district of Northern Mexico, in which the city of Torreon is located. The water supply for the district comes from the Nazas River, that has its periodical overflows, and, during the remainder of the time is ordinarily dry. The Federal Government has been working on surveys and plans for several years looking to the construction of a big dam at some point just below where the river leaves the mountains, with the view of storing an enormous volume of water for supplying the planters of the valley, according to their respective needs for irrigation the whole year through, instead of being dependent upon the periodical overflows and smaller storage reservoirs, as at present.



VIEW OF ELECTRICALLY OPERATED ROLLING DAM IN MEXICO.

The rolling dams are an interesting and practical novelty which are said to be specially valuable in controlling the water supply of the different canal systems. One of the benefits which the dams perform is that of permitting the uninterrupted flow of water through the streams in time of flood. This is done by lifting the cylinders above the flood water, and, when the current has subsided to a point where the danger of overflow is past, lowering them again and conserving the remainder of the flow.

These rolling dams in the Laguna district are of considerable magnitude. The first one to be constructed was on the San Marcos cotton plantation, owned by William Purcell, of Saltillo, Mexico. Federuco Wulff, a civil engineer of Torreon, designed the structure, and it was erected under his direction. It comprises two cylinders, each about sixty feet long and eight feet in diameter strengthened by interior bracing. While this first dam has been in operation only a comparatively short time. it is said to have given such satisfaction that other planters are taking steps to erect similar works upon their canal systems. Embraced in the irrigation project of which this dam forms a part is the watering of about three hundred thousand acres of land.

The installation of a rolling dam much larger than the first one he constructed is now being made by Mr. Wulff in the great canal upon the plantation of the Sociedad del Tajo de la Trasquila in the Laguna district. This dam will cost approximately $250,000. It will consist of two cylinders, each ninety feet long and twelve feet in diameter. The power equipment will be so arranged as to enable the lifting of these cylinders to a height of twenty-five feet to get them out of the high waters when necessary. The cylinders of this new dam, when in position, will back the water of the canal in its low stages to a height of twelve feet. When lowered the cylinders rest upon the masonry part of the dam in the river bed, filling with water. The power equipment for raising and lowering the cylinders of the dam will be two direct-coupled electric motors. The hoisting equipment of the rolling dams is located above the masonry pier in the center of the river or canal, between the two cylinders. Each cylinder is controlled independently of the other.

The valley of the Nazas River is sandy, and in former overflows of the stream it has frequently shifted its channel when it met with obstructions, such as masonry dams. Under the new rolling dam system that is coming into use in the valley it is expected that the channel of the river will be kept open in time of high water and this obviates the changes of channel that have brought no little damage in times past.

The Industrial Safety Association.

David Williams, of New York City, invited a number of the technical editors of that city to be his guests at the Engineers' Club on Wednesday evening, March 1. After the repast Mr. Williams spoke at some length respecting the work of the Industrial Safety Association, and was followed by Prof. F. R. Hutton, president of the American Museum of Safety, who described and illustrated by means of lantern slides a number of the safety devices that had been approved and were on exhibition in the rooms of the Museum. A copy of the new *Journal of Industrial Safety* (Vol. 1, No. 1, dated February 11, 1911) was presented to each of the guests.

The offices of the American Museum of Safety are located in the United Engineering Building, New York City, and are open between the hours of 9 o'clock and 5 o'clock every day except Sundays and holidays. The officers are as follows: president, F. R. Hutton; vice-presidents, Charles Kirchhoff, Henry R. Towne, T. Commerford Martin; managers, Philip T. Dodge, D. S. Jacobus, Arthur Williams, Frank E. Law, Ira H. Woolson; secretary, William J. Moran; treasurer, Robert A. Franks.

Among other members are: Andrew Carnegie, George C. Boldt, Alexander C. Humphreys, E. D. Meier, Jesse M. Smith, Paul B. Morgan, R. G. Clapp and L. B. Stillwell.

Electrification in England.

Preliminary steps have been taken in England to electrify the London, Brighton & South Coast Railway. The cost is estimated at $7,300,000. It is proposed to use the single-phase system.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

GEORGIA RAILWAY & ELECTRIC.

The Georgia Railway & Electric Company reports for the year ended December 31, 1910, compared as follows:

	1910	1909
Gross earnings	$4,040,886	$3,673,007
Operating expenses	1,908,444	1,770,142
Net earnings	2,132,442	1,902,865
Other income	45,854	38,054
Total income	2,178,296	1,940,919
Charges and taxes	847,605	845,242
Balance	1,330,691	1,095,677
Preferred dividend	120,000	120,000
Balance	*1,210,691	975,677
Common dividend	553,449	510,876
Surplus	657,242	464,801

*Equal to 14.2 per cent on $8,514,600 common stock.

BUFFALO GENERAL ELECTRIC.

The Buffalo General Electric Company has issued its report for the year ended December 31, 1910, which compares as follows:

	1910	1909
Gross operating revenue	$1,085,311	$967,455
Operating expenses and taxes	665,523	599,722
Income from operation	419,788	367,732
Non-operating income	43,447	40,629
Gross income	463,235	408,361
Interest	133,887	123,299
Net income	329,348	285,061

KANSAS CITY RAILWAY & LIGHT.

The report of the Kansas City Railway & Light Company, for the month of January and eight months ended January 31, 1911, compares as follows:

	1911	1910
January gross	$ 656,606	$611,919
Expenses	355,486	324,451
January net	301,120	287,468
Charges and taxes	188,071	169,632
January surplus	113,049	117,836
Eight months gross	5,170,197	4,785,616
Expenses	3,056,665	2,720,656
Eight months net	2,113,532	2,064,960
Charges and taxes	1,511,315	1,378,754
Eight months surplus	602,217	686,206

KINGS COUNTY ELECTRIC.

The report of the Kings County Electric Light & Power Company for the month of January compares as follows:

	1911	1910
January gross	$447,910	$393,217
Expenses	199,991	168,304
January net	247,919	224,913
Charges, depreciation, etc.	118,052	106,271
Surplus	129,867	118,642

PHILADELPHIA COMPANY.

The report of the Philadelphia Company for the month of January and ten months ended January 31, compares as follows:

	1911	1910
January gross	$2,004,306	$2,036,638
Expenses and taxes	1,032,121	1,090,061
January net	972,185	946,577
Ten months gross	17,200,207	16,148,889
Expenses and taxes	9,666,257	9,315,739
Ten months net	7,533,950	6,833,150

BELL TELEPHONE OF CANADA.

The Bell Telephone Company of Canada reports for the year ended December 31, 1910, compared as follows:

	1910	1909
Gross	$5,510,685	$4,949,197
Expenses, bond int., etc.	3,963,560	3,480,308
Net income	1,547,125	1,468,889
Dividends	1,000,000	1,000,000
Surplus	547,125	468,889

BELL TELEPHONE OF PENNSYLVANIA.

The Bell Telephone of Pennsylvania reports for the year ended December 31, 1910, compared as follows:

	1910	1909
Gross	$18,349,425	$16,171,839
Expenses	13,813,518	11,690,058
Net	4,535,907	4,481,781
Interest	245,886	304,280
Balance	4,290,021	4,177,501
Dividends	3,550,784	3,500,500
Surplus	739,237	677,001

LEHIGH VALLEY TRANSIT COMPANY.

The Lehigh Valley Transit Company reports for January as follows:

	1910	1909
January gross	$78,511	$62,569
January net	29,782	14,994

KEYSTONE TELEPHONE COMPANY.

The Keystone Telephone Company of Philadelphia reports for the month of January and seven months ended January 31, 1911, as follows:

	1911	1910
January—		
Gross	$ 96,091	$ 94,314
Net	47,756	44,407
Surplus after charges	23,318	18,049
Seven months—		
Gross	668,571	645,367
Net	335,153	321,375
Surplus after charges	163,646	143,855

UNION RAILWAY, GAS AND ELECTRIC.

The Union Railway, Gas & Electric Company (controlling electric railway and light companies operating in and around Springfield, Peoria, Rockford, Ill., and Evansville, Ind., etc.), reports combined earnings of subsidiary companies for the year ended December 31, 1910, compared as follows:

	1910	1909
Gross	$2,981,711	$2,820,349
Expenses	1,633,954	1,468,415
Net	1,347,757	1,351,934
Charges	796,257	773,664
Surplus	551,500	578,270
Preferred dividends	314,165	313,687
Surplus	237,335	264,583

WASHINGTON WATER POWER COMPANY.

The Washington Water Power Company has issued its annual report for the year ended December 31, 1910, which shows a surplus available for dividends of $918,773, equal to 9.78 per cent on the $9,390,100 capital stock outstanding, as compared with 9.34 per cent on the $7,233,200 stock outstanding the previous year.

The income account compares as follows:

	1910	1909.
Gross	$3,155,223	$2,788,742
Expenses and taxes	1,678,540	1,503,895
Net	$1,476,683	$1,284,847
Charges, depreciation, etc.	557,910	609,811
Surplus	$ 918,773	$ 675,036
Dividends	708,231	442,424
Surplus	$ 210,542	$ 232,612
Previous surplus	860,499	874,150
Total surplus	$1,071,041	$1,106,762
Adjustment debit		*246,263
Profit and loss surplus	$1,071,041	$ 860,499

*Interest, discount and expense on account of prepayment of coupon notes, etc.

AMONG THE CONTRACTORS AND SUPPLY MEN

W. C. DELL & COMPANY have engaged in the electrical supply business in Charlotte, Mich.

JAMES GRAY, of Bloomington, Ill., received the contract for the installation of the electrical fixtures in the new Bloomington Club. Z.

THE R. HAAS ELECTRIC & MANUFACTURING COMPANY of Springfield, Ill., did the electrical work in the handsome new Ridgely National bank. The direct-indirect lighting system was used.

THE BEST PLUMBING AND HEATING COMPANY has been incorporated with a capital stock of $30,000. Doing a general electrical business is one of its objects. The incorporators are Ezra Best, Seward Best and T. Russell Bunting. Z.

THE T. J. ROWLER HARDWARE COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $10,000 to deal in electrical supplies. The incorporators are Thomas J. Bowler, Samuel L. Stringer and Leslie A. Needham. Z.

THE ELECTRICAL CONSTRUCTION & SUPPLY COMPANY, Muncie, Ind., located in the Delaware Hotel Building, 210 South Mulberry Street, will be moved into new quarters in a short time. The new rooms will be ready for occupancy by March 1.

Exports of Copper.

Exports of copper for the month of February were 18,992 tons, against 25,238 tons for the same month last year.

Telephone Workers Needed in Manitoba.

The demand for telephone construction in Manitoba exceeds the abilities of the construction force; 550 men were employed last year and 450 more could have been given work, but were not available. K.

Power-Plant Testing.

At a meeting of Armour Institute of Technology Branch of the American Institute of Electrical Engineers held on March 2, Erik Fenger, testing engineer of the Sanitary District of Chicago, read a paper on "Theory and Engineering in Power-Plant Testing."

New Electrical and Mechanical Apparatus and Appliances.

Direct-Current Motor Starting Panels for Heavy Service.

An increasing demand has arisen, especially in the steel and cement industries, for electrical apparatus of rugged construction and liberal proportions, owing to the fact that apparatus as ordinarily designed does not always stand up under the heavy service imposed. There is also a demand for safety attachments for controlling apparatus to prevent unskilled operators from endangering life or apparatus.

The General Electric Company has recently designed and built a number of

DIRECT-CURRENT MOTOR STARTING PANEL.

direct-current motor control panels which meet the requirements of heavy service and safety in every way. The accompanying illustration shows very clearly the rugged character of these panels. The equipment consists of a slate panel mounted on 1.25-inch pipe supports and braced to the floor or wall by means of pipe braces.

The starting resistances are usually set on the floor and connected to the switch by means of leads. When the equipment is for a small motor, suitable arrangements can be made for mounting the starting resistance on the panel pipe supports. It is impossible, with the starting switch, to operate otherwise than step by step. A pawl on the handle lever engages in teeth on a ratchet wheel rigidly attached to the contact blade. As the handle is operated back and forth with a sort of pump handle motion, the ratchet wheel is turned and thus the blade is moved from one contact to another.

The circuit-breaker and starting switch are interlocked in such a manner that the circuit-breaker cannot be closed until the starting switch is in the "off" position. Also if, after the circuit-breaker is closed and the starting switch is in an intermediate position, the operator removes his hand from the starting-switch handle, the circuit-breaker will immediately open. Where a field switch is supplied it is also interlocked with the circuit-breaker so that the latter cannot be closed unless the field switch is closed. The opening of the field switch causes the circuit-breaker to trip. All the parts are strong and will stand considerable rough usage.

Metal Trades Association at Cincinnati.

A delegation of about seventy-five shop superintendents and managers from Chicago attended the annual meeting of the Cincinnati Metal Trades Association on Thursday, March 2. During the course of the day the entire party inspected the plant of The Triumph Electric Company and were very favorably impressed with the modern methods employed in this shop. The Triumph Company is exceptionally busy at the present time, and in addition to the ordinary day shift is working a night shift three nights a week.

A banquet was held in the evening at the Business Men's Club, and a thoroughly enjoyable time was spent.

Producing Cedar Poles.

Many users of cedar poles have no doubt often wondered as to methods used

HAULING A LOAD OF CEDAR POLES FROM THE FOREST.

in the production of this necessary adjunct to pole-line construction. In the accompanying illustration is shown a view of the method used by the Crawford Cedar Company, of Menominee, Mich., one of the largest producers of Michigan white cedar products, in getting its poles out of the woods. The picture shows a typical load containing 306 large cedar poles. A tree of ordinary size having, say, a butt measuring from twelve to fifteen inches, is felled in from three to five minutes. After being felled the tree is trimmed, "swamped," peeled, and then skidded to a branch road. From the branch road the poles are loaded and hauled to the main line, then to the banking ground.

From that point they are hauled to the river and then rafted to the main yard in Menominee.

The Crawford Company will this winter produce from its own timber lands, about 125,000 poles from twenty foot up to seventy foot. In addition perhaps 50,000 other poles will be purchased, which, with about 25,000 measuring less than twenty feet, will bring the total up to 200,000 poles at the disposal of the consumer.

While it is well known that cedar stumpage is scarce, the Crawford Company has a very large acreage in Cedarville Township, Menominee County, Mich., and will be able to supply the trade for many years to come.

New Indirect Lighting Units.

The Eye-Comfort System of indirect illumination presents to the fixture designer a new field for his talents. Many new designs of stock fixtures are being produced by the National X-Ray Reflector Company, Chicago, the originators and sole distributors of this system of lighting. The company's stock

INDIRECT LIGHTING FIXTURE NO. 701, EQUIPPED FOR 100-WATT LAMP.

fixtures are sold only through the electrical trade and are supplied by the manufacturers complete or in part, in the latter event the trade doing the assembling, wiring, etc.

The accompanying illustrations show two of the new types of Eye-Comfort fixtures designed for residence lighting. No. 733 is a shallow bowl type that takes four sixty-watt lamps in the reflector which is specially designed to hold the lamps in a horizontal position.

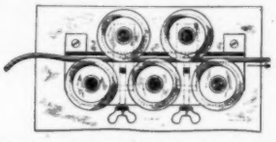
This is a comparatively inexpensive

FIXTURE NO. 733, EQUIPPED FOR FOUR SIXTY-WATT LAMPS.

fixture. No. 701, a more expensive fixture of art glass, takes either a 100 or 150-watt lamp in the reflector. This lamp is arranged for vertical mounting with the tip up. Either of these fixtures with the equipment mentioned will illuminate a good-sized living room.

Economy Wire Straightener.

The accompanying illustration shows the Economy wire straightener, made by John P. Haga, 1019 East 28th Street, Minneapolis, Minn. The purpose of this machine is to straighten wire from the coil and it accomplishes its function as fast as the wire can be pulled through the machine. The device consists of five steel rollers with a V-shaped groove, fastened to a steel angle iron as shown in



ECONOMY WIRE STRAIGHTENER SHOWING METHOD OF OPERATION.

the illustration. It can be adjusted with the aid of two thumb-screws to take any size wire up to one-half-inch in diameter. The machine is already extensively used and the patentee claims it is giving the best of satisfaction and will fill a long-felt want.

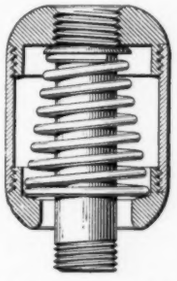
Convention of German Electrical Engineers.

The annual convention of the German Society of Electrical Engineers, which is to be held in Munich from May 29 to June 1, will be devoted to the subject, "Electricity in the Home." In connection therewith the Electric Club of Munich is arranging for an exhibition of appliances for household use.

National Shock Absorbers.

Although the fragility of tungsten-filament lamps is constantly being lessened they are often installed, owing to their high efficiency, where their life would be materially increased if equipped with suitable shock absorbers. In the accompanying illustrations are shown two types of a complete line of shock absorbers which the National Electric Equipment Company, 15 Beacon Street, Boston, Mass., is placing on the market.

The type A absorber shown is designed to support a lamp of 25 to 100 watts, with socket and shade. This type is also made for lamps of this size without shade. Type H absorber is a neatly



SECTIONAL VIEW OF TYPE H ABSORBER.

FULL-SIZE VIEW OF TYPE H SHOCK ABSORBER.

FULL-SIZE VIEW OF TYPE A SHOCK ABSORBER.

designed device adapted for use in connection with residence fixtures. The accompanying sectional view of the type H absorber illustrates clearly the construction of these devices. The Company also makes shock absorbers suitable for shop clusters, etc.

Pennsylvania Orders Additional Locomotives.

Nine more electric locomotives, aggregating about 40,000 horsepower, have been ordered by the Pennsylvania Railroad from the Westinghouse Electric & Manufacturing Company. The new locomotives will be of the same type as those which are now being operated in the Manhattan Terminal, New York City, and will supplement the twenty-four already in use. The Westinghouse Electric & Manufacturing Company has contracted to have the new locomotives completed by July 1, 1911.

The cabs, frames, running gear and mechanical parts will be built by the Pennsylvania Railroad at their Juniata shops. The air brakes will be supplied by the Westinghouse Air Brake Company. The electrical equipments will be built and the complete locomotives assembled at the East Pittsburg Works of the Westinghouse Electric & Manufacturing Company.

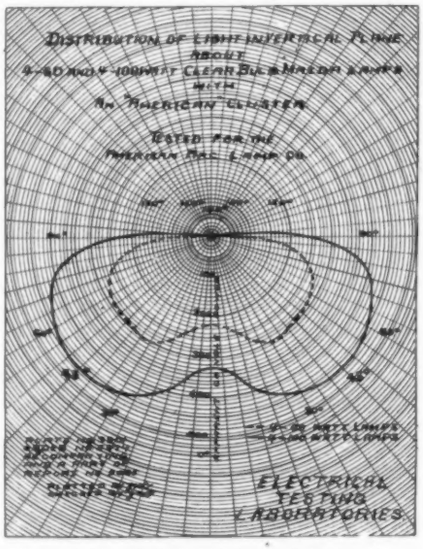
The Pennsylvania locomotives are by far the most powerful ever built. The locomotive is an articulated machine of double cab design. Each half carries its own motor and complete equipment and the two halves are coupled together at their driving wheel ends.

The wheel and motor arrangement was decided upon only after careful experiments with several other forms, both of motor drive and wheel arrangement; the governing motive being to secure the greatest possible steadiness of speed.

The contract tractive effort of this locomotive is 60,000 pounds and the maximum draw-bar pull 79,200 pounds. It is a direct-current, 600-volt machine.

Light Distribution Tests of American Shop Clusters.

The American Arc Lamp Company, Kalamazoo, Mich., has ready for distribution a book of distribution curves and full detailed reports of the Electrical Testing Laboratories, New York, N. Y., on four-light shop clusters and shop units. Of particular interest in this connection is the report on shop cluster No. 545, an all-steel unit which the Company claims is meeting with marked success in the numerous installations in which it figures. The report of the laboratories seems to substantiate the claims that were made for this cluster.



DISTRIBUTION CURVE FOR FIXTURE NO. 545.

In testing the light source was held at approximately ten feet from the photometer disk throughout measurements. All determinations are expressed in the new unit, which is 1.6 per cent smaller than the old candlepower unit. The following results were obtained; the cluster being equipped with four sixty-watt and four 100-watt clear-bulb Mazda lamps:

Angles in Vertical Plane, Degrees.	—Apparent Candlepower— Four 60-watt Lamps.	Four 100-watt Lamps.
100	....	52.
90 (hor.)	103.	226.
75	248.	408.
60	287.	448.
45	292.	462.
30	301.	448.
15	246.	390.
0 (Nadir)	219.	326.

The distribution of light is shown graphically in the accompanying illustration. The following is a table of curves:

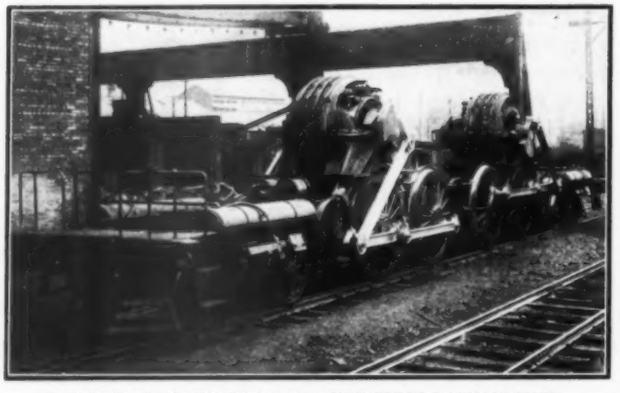
60-WATT LAMPS.

	Deg.	Deg.	Deg.	Deg.	Deg.
Degrees from Vertical.	15	30	45	60	75
Reflected candlepower.	245	300	295	285	250

100-WATT LAMPS.

	Deg.	Deg.	Deg.	Deg.	Deg.
Degrees from vertical.	15	30	45	60	75
Reflected candlepower.	390	450	465	450	410

The American shop cluster tested was seventeen inches in diameter, four and one-half inches deep and was equipped with four sockets equally spaced on a three-inch radius. The light measurements were made in a vertical plane at fifteen-degree intervals. The vertical plane selected was that in which all lamps could be seen at ninety degrees, or a plane passing through the center of the reflector, and a point one-third the distance between the two adjacent lamps. Measurements were made in several other planes and found substantially the same, therefore the above mentioned plane was regarded as a mean. The lamps used were carefully selected for rated candlepower at one voltage.



CHASSIS OF PENNSYLVANIA ELECTRIC LOCOMOTIVE.

LOCOMOTIVE HAULING LONG TRAIN OF CARS.

General Electric Company's Orders.

The orders received by the General Electric Company during the month of February showed a perceptible increase, and averaged at the annual rate of $58,000,000.

Electric Fans for 1911.

The more varied uses to which the electric fan is being subjected is perhaps responsible for the increased number of designs offered by electric-fan manufacturers for the season of 1911. Although few of the manufacturers have made any radical innovations in their well-tried and proven designs it is notable that the majority of manufacturers have increased the number of their patterns, thereby making it possible to offer fans for every conceivable purpose.

The convertible fan, which is so arranged mechanically that it can easily be converted from a desk fan to a bracket fan without the use of tools or additional parts, seems to lead the standard designs for this season. Oscillating fans are being standardized and improved oscillating mechanism apparent in many of this year's models of mechanical oscillators make for quiet running and altogether satisfactory service. Many of the manufacturers continue to make the standard ceiling and column fans in all their varieties although the portable fan is fast superseding this type in the majority of installations. Improvements have been made in portable battery fans which are operated by storage and dry batteries and permit of being used in places where it would be impossible to use the regular fans.

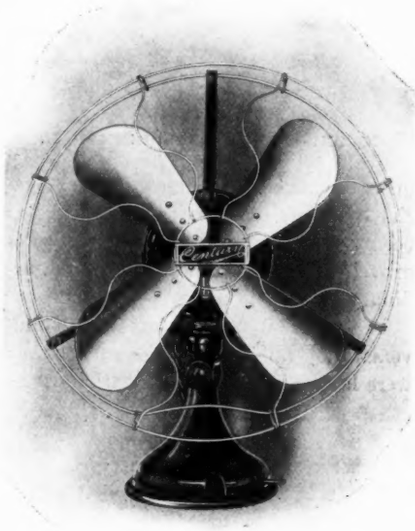
Among the offerings for 1911 are the following:

ADAMS-BAGNALL ELECTRIC COMPANY.

The Adams-Bagnall Electric Company, Cleveland, O., is, this year, manufacturing and placing on the market the Jandus fans. These comprise the direct and alternating-current swivel-and-trunnion desk or bracket fans, oscillating fans, in sizes of twelve and sixteen inches and alternating and direct-current eight-inch desk and oscillating fans in addition to a complete line of ceiling and column fans of all types.

The specifications for the 1911 direct-current fans of twelve-inch and sixteen-inch sizes are: Frame—stamped-steel inclosing shells, cast base, all finished in black enamel; field—soft laminated iron core, flexibly supported so as to withstand shocks and jars; armature—soft laminated iron, core wound with double-silk covered wire; bearings—self-aligning, self-oiling, made of phosphor bronze; shaft—crucible steel ground to size; blades and guards—finished in dipped and lacquered brass, blades specially constructed so as not to flatten when running at full speed; trunnion yoke—novel construction, made by forming two one-quarter-inch steel rods into a strong and rigid support for the motor body; base—cushioned with rubber ring rectangular in cross-section and countersunk in machined groove; speeds—four-point switch, three speeds, and adjustments—swivel-and-trunnion, desk and wall bracket.

The direct-current oscillating-type desk or bracket fan is divided into



CENTURY ALTERNATING-CURRENT DESK FAN.

two classes—the vane and the positive drive, the former depending for its angular motion upon the impingement of the air blast upon a movable metal vane and the latter upon motion transmitted by a train of gears. The motor body is mounted within a crescent-shaped yoke by means of two hardened-steel pivot points which protrude from the yoke and engage with top and bottom points on the motor-body ring, thus insuring free oscillation about the vertical axis of the motor. This season's fan is much improved by the addition of ball bearing for the lower steel pivot point. This construction reduces the wear to a minimum and furnishes a satisfactory method of lubricating the lower bearing upon which the entire weight of the motor ball falls.

The actuating mechanism consists of two steel gear wheels, forming the simplest type of differential gear. One is stationary and the other is actuated by means of an eccentric carried by the motor shaft. The movable gear is attached to a neat cast housing, which serves three purposes: (a) covering for gear; (b) oil-tight lubricating box; (c) holder for arm engaging with groove in the crescent yoke. The end of this arm is fitted with a resilient pin, which moves up and down in the crescent yoke groove and by adjustment of which different angles of oscillation can be obtained.

The Jandus alternating-current fans of both the swivel-and-trunnion types and oscillating types are of the induction-motor type, single phase, self-starting and entirely free from moving contacts. The mechanical construction of these fans is the same as for the direct-current fans and they are also made in twelve-inch and sixteen-inch sizes. The eight-inch fans are available for either direct or alternating-current circuits, in all styles, and embody the same characteristics of design as the larger fans.

CENTURY ELECTRIC COMPANY.

A number of changes in important details are announced by the Century Electric Company, St. Louis, Mo., for its 1911 electric fans.

The Century fan motors are what is commonly known as the split-phase induction type, no moving wire being used in their construction. The construction of the cast-iron motor frame and laminated field is such as to permit of a maximum amount of ventilation, resulting in the fan operating with an exceptionally low temperature rise. The rotor is the well-known squirrel-cage type. The shafts are constructed of high-grade steel and ground to accurate dimensions, hence the bearing friction is reduced to a minimum. Every part is built to standard gauges and is interchangeable.

To provide a close adjustment of speed, a five-point speed-regulating switch is located in the base of the fan. The contact points are of such construction, that the contact is positive and substantial. The standard winding and connections are for 100-108 and 110-120 volts; a third terminal being provided

on the switch base to permit of proper connections being made for the voltage of the circuit on which the fan is to be used. The speed-regulating coil is located in the base of the fan immediately above the switch.

The fans will operate satisfactorily on all variations of voltage and frequency between five per cent above or below that for which they are wound and connected, although the amount of speed variation will be affected by any change in either voltage or frequency.

Each fan is provided with swivel and trunnion and can be converted to a bracket type without extra parts. The trunnion is provided with a positive lock to hold the motor in any position it may be tilted to, and consists of several thin steel plates—one-half of which are fastened to the motor, the other one-half to the yoke—the thumb screw clamping them together after the fan has been tilted to the desired angle.

Oscillating fan motors can be used as either desk or wall bracket fans without extra parts. When tilted from a horizontal adjustment, throughout its 120 degrees of oscillation, the air is blown in the same plane. When the motor is operating at full speed, it will make about six complete oscillations per minute, which has been found to be the number most efficient and best suited to the majority of conditions. The oscillating fans are not equipped with a multiple-speed switch.

The Century ceiling fans are of the split-phase induction type. The fan blades are made of carefully selected material, all have a sweep of fifty-eight inches, and have a highly polished mahogany finish.

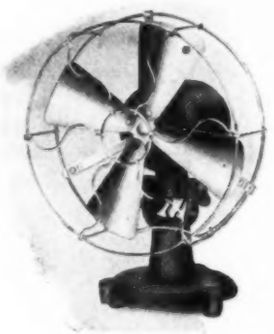
The sixty-cycle fans, operating on a sixty-cycle circuit of the voltage for which they are wound, will run at a speed of at least 240 revolutions per minute, and a corresponding speed when the frequency varies from sixty cycles. All fans are equipped with a two-speed switch: the slow speed being about 180 revolutions per minute on sixty-cycle circuits.

All 110-volt ceiling fans are provided with an extra terminal to permit of satisfactory operation on 100 volts, and the speed coil is provided with extra terminals to permit of the proper second speed being secured. The fans will operate satisfactorily on frequencies varying as much as five per cent above or below that for which they are wound.

COLONIAL FAN & MOTOR COMPANY.

The general construction and design of Colonial direct-current desk and ceiling fan motors will remain practically the same for the year 1911 as they were for the season of 1910, but few changes being necessary, owing to the universal satisfaction which they gave last year.

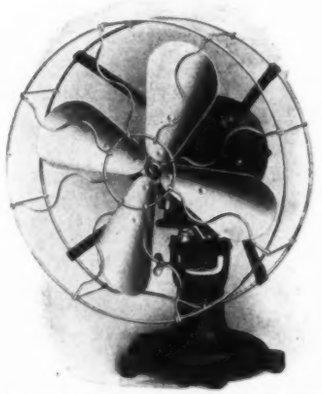
In connection with the eight-inch fan, the Company states that it did not seem possible to make any improvements



COLONIAL UNIVERSAL DESK FAN.

upon it, excepting that a brush of special construction is now used which has been found, by test, to have greatly improved the lasting qualities over the ordinary brush.

The twelve-inch and sixteen-inch universal desk fans will be the same as they were last year, with the exception of the



COLONIAL UNIVERSAL OSCILLATOR.

improvments as to efficiency, quiet operation, etc.

The oscillating fan, which is of universal desk or bracket type, will be of the same general geared construction, excepting that a great many of its parts have been strengthened; or, in other words, every improvement has been made, covering every point, where it was possible to cause trouble, so that the 1911 oscillator will be of as near perfect construction, smooth operation, and as economical as to current consumption as it is possible to produce.

The direct-current ceiling fan will be made in the plain, as well as in the ornamental type; and the oilless bearing will be used, which was a very satisfactory feature last season, and which does away with the one very objectionable feature to the former type of ceiling fan; viz., that of the oiling device. The oilless-bearing ceiling fan needs no oil whatever, but is guaranteed to operate noiselessly, and satisfactorily, without oil.

In addition to the direct-current line, the Company will also manufacture a line of single-phase, sixty-cycle alternating-current desk, universal desk and bracket fans, and oscillating fans. The universal fan will be made in the eight-inch, twelve-inch and sixteen-inch sizes; the oscillating fan in the twelve-inch and sixteen-inch sizes.

The Colonial alternating-current desk fan is of the induction, automatic-starting type, embodying the same special features as the Colonial direct-current fan; *viz.*, the universal joint, making it possible to instantly convert desk fan into bracket type, and *vice versa*.

The guards and blades are of solid brass, the fan being equipped with a two-speed switch and cut-out; the twelve-inch fan having speeds of 1,600 and 1,300 revolutions per minute, the sixteen-inch fan having speeds of 1,550 and 1,300 revolutions per minute.

CROCKER-WHEELER COMPANY.

The Crocker-Wheeler Company, Ampere, N. J., has developed a line of exhaust fans that, while not of radically new design, are worthy of mention. One of the distinctive features of the Crocker-Wheeler exhaust fan is the lubricating system of the motor. The careful design of this system prevents such troubles as hot bearings, short-circuiting, etc.

Quietness of operating is often an absolute requirement for fan motors. This subject has been given very careful consideration by the engineers of the Crocker-Wheeler Company in the design of its motors. The possibility of noise resulting from the mechanical construction of the motor has been virtually eliminated by careful construction of the brush-holders and commutator. The annoying hum, which results from the magnetic action of motors, has been reduced to a minimum, by proper proportioning of the magnetic circuit.

Where the fan must be placed in a damp location or used to remove foul air, deterioration may be prevented only by use of the very best quality of insulation. The insulation of these fans is given a rigorous test before leaving the works. This test also covers thoroughly all structural characteristics. Any machine that does stand up is turned back to the shop and rebuilt. These fan outfits are constructed both for horizontal and for vertical operation. The motors are furnished with inclosing covers where conditions make this desirable.

DIEHL MANUFACTURING COMPANY.

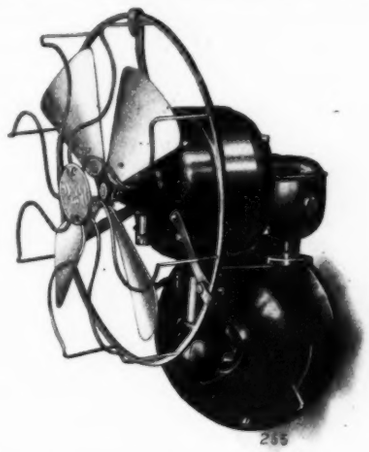
The line of fans offered for the season of 1911 by the Diehl Manufacturing Company, Elizabethport, N. J., comprises direct-current universal desk and bracket fans of the swivel-and-trunnion type, in twelve-inch and sixteen-inch sizes; twelve-inch and sixteen-inch sizes of alternating-current fans of the same type; eight-inch direct and alternating-current fans for residence and telephone-booth use and direct and alternating-current universal oscillator fans in addition to a complete line of alternating and direct-current ceiling and column fans.

DIEHL UNIVERSAL DIRECT-CURRENT FAN.

The universal desk and bracket fans are provided with swivel-and-trunnion features by means of which a current of air can be thrown in any direction. Speed regulators are provided, giving three running speeds.

The eight-inch residence and telephone-booth type fans are made as convertible desk and bracket fans. The residence type is adjustable vertically through a wide range and may be secured in any position by a thumb-screw. The telephone-booth type is suspended on springs which prevent any vibration.

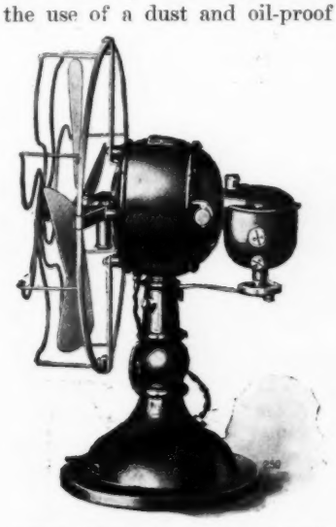
The Diehl oscillator fans are provided with the universal feature, which admits of their use as desk or bracket fans as desired. The divided-ball joints have corrugated steel washers on their



DIEHL DIRECT-CURRENT OSCILLATING BRACKET FAN.

faces, allowing an adjustment to any desired angle by means of the wing screw shown in the illustration.

The oscillatory movement is obtained by the use of a dust and oil-proof de-



DIEHL OSCILLATING DESK FAN.

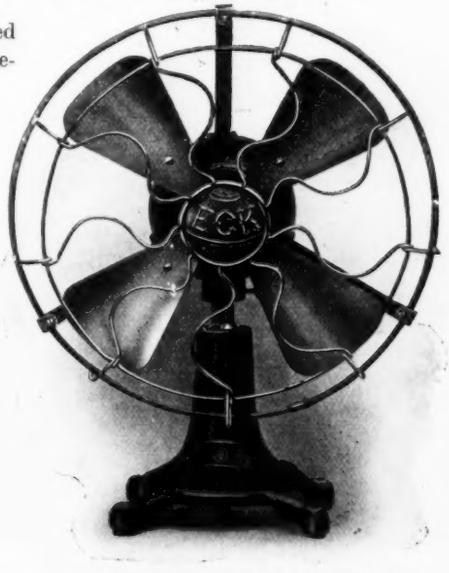
tachable case, which contains a series of worm and bevel gears. The armature shaft carries a worm of comparatively large size, which with the wheel that it drives is carefully designed with special teeth to reduce wear to a minimum. This worm is the only one at all subject to wear, and it can be replaced without difficulty if necessary, being readily removable from the armature shaft. The arrangement of the gearing is such that all other parts run at very slow speed and hence will last indefinitely.

All of the gearing runs in grease at all times and is absolutely noiseless in operation. Means are provided by which the oscillatory movement may be varied by a simple adjustment easily made.

ECK DYNAMO & MOTOR COMPANY.

The Eck Dynamo & Motor Company, Belleville, N. J., with offices and stockrooms at 19 Murray Street, New York City, is putting out a line of "Eck Hurricane" direct-current fans for 1911, which possess some commendable features.

The "Eck Hurricane" oscillating fans are made in twelve and sixteen-inch sizes for direct-current not exceeding 250-volts pressure. These fans are designed for use in stores, restaurants, hotels, offices, factories, theaters and dwellings, and are practically noiseless in operation. The time and length of operation are positively regulated and the fans oscillate equally well whether level or tipped forward, at any or all of the three speeds provided, in all positions, or within wide or narrow limits.



ECK SIXTEEN-INCH DESK FAN.

The oscillating feature is a worm gear submerged in grease. As an additional precaution a friction disk is used in the gear wheel so that if the fan is prevented from oscillating by any cause the gears will not be subjected to an extraordinary strain. By the use of the positive gear, it may be noted, there is no obstruction to the air current as is the case when wind-operated oscillating

EMERSON ELECTRIC MANUFACTURING COMPANY.

The Emerson Electric Manufacturing Company, St. Louis and New York, offers for 1911 a complete line of induction desk, oscillating and ceiling fans. This line includes eight-inch, twelve-inch and sixteen-inch swivel-trunnion desk fans, eight-inch hinge-type desk fans, twelve and sixteen-inch oscillating fans, special twelve-inch slow-speed quiet residence-type swivel-trunnion and oscillating fans, two, four and six-blade ornamental-type ceiling fans and four-blade plain-type ceiling fans.

The Emerson Company reports important improvements in several types of its induction fans for the season of 1911. The model shown in Fig. 1 is a three-speed, eight-inch Emerson induction fan with particularly good speed regulation. It has the full swivel-trunnion adjustment, sliding lever switch, patented Parker blades, hardened-steel shaft and heavy double-wire guard of the larger sizes of Emerson fans. It

FIG. 1—THREE-SPEED INDUCTION FAN.

may be converted into a swivel-trunnion bracket fan as shown in Fig. 2, without extra parts.

The twelve and sixteen-inch Emerson fans offered for general service are four-blade, two-speed fans of the same general appearance as the types illustrated above. In addition a new residence type is offered this season. This fan is shown in Fig. 3.

This new residence type is a three-speed induction fan equipped with six Parker blades. It operates at a maximum speed of 1,150 revolutions per minute and is a motor of particularly quiet design. This fan furnishes a well distributed breeze for large living rooms and operates with scarcely perceptible noise.

The residence-type fan is also made in the oscillating style, in addition to which twelve and sixteen-inch medium speed four-blade oscillators, throwing more powerful breezes, can be furnished. All Emerson oscillators have a special feature—renewable oscillating worm shaft, so that all wearing parts of the oscillating mechanism can be renewed by the user without returning the fan to the factory.

One of the novelties in fan motors

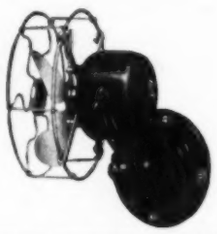


FIG. 2—SWIVEL-TRUNNION BRACKET FAN.

offered by the Emerson Company is the bedroom type shown in Fig. 4. This is an eight-inch Emerson trunnion fan mounted on a support which may be readily attached to the end post of the foot of any brass or iron bed. This fan is furnished complete with attachment plug and cord and push switch on an eight-foot reinforced cord, so that the

FIG. 3—RESIDENCE-TYPE FAN.

FIG. 5—EIGHT-INCH TROJAN FAN.

control of the fan is within easy reach of the user. It is believed this new type will prove particularly popular in hotels.

The Emerson Company also manu-

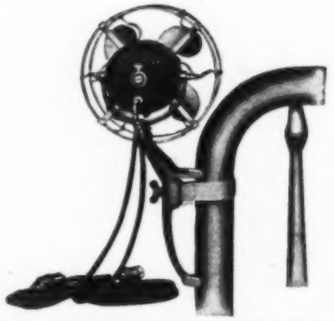
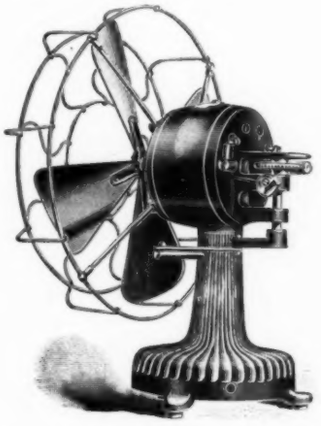


FIG. 4—BEDROOM-TYPE ATTACHED TO BEDPOST.

factures the Trojan line of swivel-trunnion desk and oscillating fans in twelve and sixteen-inch sizes made in previous seasons. In addition a new eight-inch Trojan fan is offered this season, which is shown in Fig. 5.

The new Trojan eight-inch fan motor is a three-speed induction motor with exceptionally good speed regulation. It has triangular blades and bronze bearings; the motor is mounted in a drawn-brass shell and base, and the motor-body, base, fan blades and guard are attractively finished in brushed brass, satin finish. It is somewhat lighter in weight than the Emerson eight-inch induction fan described above and is offered at slightly lower prices.

In ceiling fans the Emerson Company offers a two-blade ornamental type with particularly good speed regulation, for small offices, card rooms, smoking rooms, etc., where a gentle distribution of breeze is primarily desired. For general service the four-blade three-speed



FIDELITY OSCILLATING DESK FAN.

ornamental-type Emerson fan and the four-blade two-speed plain-type Trojan fan are recommended.

FIDELITY ELECTRIC COMPANY.

The Fidelity Electric Company, of Lancaster, Pa., is placing on the market a complete line of fans suitable for every purpose. These include direct and alternating-current desk and bracket fans in twelve and sixteen-inch sizes: ten-inch direct-current trunnion fans and alternating and direct-current eight-inch fans.

The eight-inch fan is particularly adapted for residence and telephone-booth use and in the latter case is provided with a suspension spring which prevents any vibration being transmitted to the booth structure. This size fan is also provided to be directly attached to a lamp socket when used on direct-current circuits.

The ceiling fans offered by this company for the season of 1911 include types B and Y direct-current fans which

can both be equipped with electroliers if desired. Both have four blades and the regulation sweep. They are made for all commercial voltages and have two speeds.

FORT WAYNE ELECTRIC WORKS.

The Fort Wayne Electric Works, Fort Wayne, Ind., has made its line of fans for 1911 include a complete assortment of styles and sizes for all purposes. The fans are designed for all standard voltages and frequencies, and while they are substantially the same in appearance as those of last season, there have been made various improvements in important details.

The line includes eight-inch alternating and direct-current desk and wall bracket fans, both four and six blade; eight-inch alternating and direct-current telephone-booth fans and eight-inch alternating and direct-current revolving fans; twelve-inch alternating and direct-current swivel-and-trunnion oscillating desk and wall bracket fans; sixteen-inch alternating and direct-current swivel-and-trunnion universal desk and wall bracket fans. Also a complete line of alternating-current and direct-current counter-column, floor-column and ventilating fans.

Special attention is called to this year's eight-inch fans which have a number of commendable features. They are neat in appearance, easily portable, noiseless, and give an especially efficient breeze. These motors are unlike the ordinary induction fan motors in that they are designed to operate without a centrifugal switch or mechanical cut-out device. In the ordinary types there is great danger of the contact device sticking and burning out the starting coils.

The design of this motor also reduces the starting watts to a minimum and makes it possible for it to stand stalled with the current on without danger to the winding. Another great advantage is its extreme simplicity which practically guarantees and eliminates all annoying breakdowns and expensive repairs due to commutator troubles, brushes wearing out, springs loosing temper, etc. They are equipped with four-point regulating switches which provide three running speeds.

GENERAL ELECTRIC UNIVERSAL BRACKET FAN.

The frame and base are made of drawn metal which gives them a handsome smooth surface. It requires no more room than a desk telephone and weighs about the same.

GENERAL ELECTRIC COMPANY.

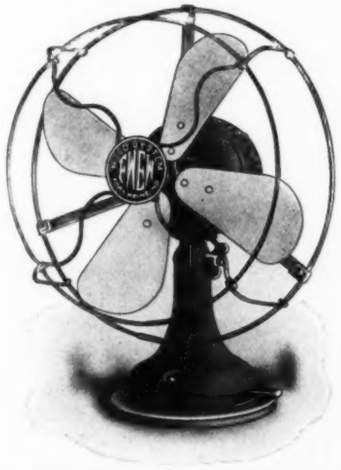
The General Electric Company's fan-motor models for 1911 represent an exceptionally complete line designed for satisfying the requirements of a wide field of application. Several marked improvements are noticeable, one of particular importance being the adoption of a new induction winding for the eight, twelve and sixteen-inch alternating-current fans, which obviates the use of a centrifugal switch for controlling the starting winding, thus eliminating all noisy contacts and insuring quiet operation with low energy consumption and good speed range.

The entire line includes both alternating-current and direct-current eight-inch four-blade desk, bracket, oscillating and telephone booth fans; twelve-inch six-blade residence, bracket and oscillating fans; twelve and sixteen-inch standard desk and bracket fans; twelve and sixteen-inch oscillating fans for either desk or bracket use; together with a great variety of ceiling counter-column and floor-column motors of attractive plain and ornamental design.

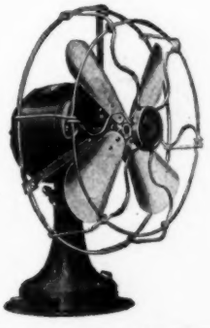
The desk, bracket and oscillating fans in general are readily convertible for either desk or bracket use and vice versa, by means of a hinged joint, attaching the motor body to the base, which permits of an extremely simple and quick vertical adjustment. The telephone-booth fans are suspended from suitable brackets by means of a spring suspension, thus preventing any vibration from being transmitted to the walls of the booth. The six-blade fans operate very noiselessly and are designed especially for use in residences, hospitals and other places where quiet operation is desirable.

These motors are equipped with suitable switches for giving three speeds, the maximum ranging from 1,250 to 1,600 revolutions per minute, thus providing a regulation sufficient for all requirements. The alternating-current motors carried in stock are for circuits of twenty-five cycles at 110 volts; forty cycles at 120 volts; fifty cycles at 100, 110, 220 and 220 volts, sixty cycles at 110 and 220 volts; and 133 cycles at 110 volts. The direct-current motors are for 110 and 220-volt circuits.

The alternating-current ceiling and column fan motors are designed for



FORT WAYNE EIGHT-INCH DESK FAN.



GENERAL ELECTRIC UNIVERSAL DESK FAN.

GENERAL ELECTRIC FOUR-BLADE CEILING FAN.

operation on twenty-five, forty, fifty and sixty-cycle circuits. The plain types have two speeds, ranging from 150 to 225 revolutions per minute. The direct-current motors are designed for 110 or 220-volt circuits. The plain types operate at 200 revolutions per minute. The ornamental single-speed types operate at 200 revolutions per minute, and the three-speed types at 100, 150 and 200 revolutions per minute.

Both the alternating-current and the direct-current fans are of the four-blade type, the former have a sweep fifty-two inches, and the latter fifty-eight inches. They are of handsome design, workmanship and finish, and are wired for electrolier attachments of two or four lights.

HUNTER FAN & MOTOR COMPANY.

The line of "Tuerk and "HE" fans for 1911 offered by the Hunter Fan & Motor Company, 114 Liberty Street, New York, N. Y., comprise direct and alternating-current twelve and sixteen-inch desk and bracket fans of both swivel-and-trunnion and oscillating types, eight-inch desk and bracket, telephone-booth and oscillating fans, two and four-blade ceiling fans and two and four-blade columns and counter fans.

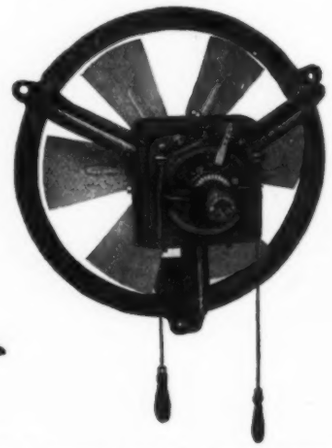
HUNTER TYPE C "TUERK" CEILING FAN.

In the accompanying illustration is shown the "Tuerk" type C four-blade alternating-current ceiling fan with electrolier attachment. This fan has a slow-speed induction motor with a two-speed regulating switch. The motor is equipped with four blades, the blades being permanently fixed at a correct angle to the revolving rotor. The four blades are six and one-half inches wide at the tip and have a fifty-two-inch sweep, operating at a speed of 225 revolutions per minute. The type C fan is particularly adapted to frequencies of 25, 40, 50 and 60 cycles. The bottom of the fan is so arranged that electrolier attachment for either 2 or 4 lights can readily be attached. The lower part of the motor case is drilled and tapped to standard thread.

ILG ELECTRIC VENTILATING COMPANY.

Direct-connected electric blowers and exhaust fans occupy a large field of usefulness. They are applicable under all conditions where a quantity of air is required at pressures not inordinately high. The advantages of direct-connected blowers and exhausters over the belted type are obvious. They can be located in places where a belted installation would be impossible. They will deliver or exhaust a given quantity of air with less power than belted installations.

Direct-connected electric blowers and fans are used extensively for heating and ventilating schools, colleges, public buildings and factories in connection with hot-blast heating apparatus. They are also used for ship ventilation, drying all kinds of materials, mechanical draft, dry-kilns, ventilating and cooling all types of buildings.



KIMBLE SINGLE-PHASE VENTILATING FAN.

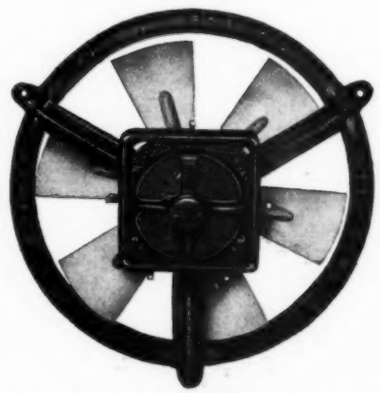
The Ilg Electric Ventilating Company, Chicago, Ill., is offering for the season of 1911 a line of fans and blowers that are worthy of mention.

The construction of Ilg blowers and exhausters is a distinct departure from methods heretofore employed by blower or fan manufacturers. The motor is machined circular and set partially into the housing, giving remarkable compactness. The motor is supported by a cast-iron ring bolted to the housing. The inlet side has a similar casting fastened in the same manner. The holes in both castings are equally spaced, drilled to template, making it possible to change any blower from right to left hand drive or vice versa. This construction also permits the discharge to be swung to any angle. The use of the round-body type motor and the method of support makes it possible to interchange or replace motor without disturbing the alinement. Both bearings are combined and are oiled simultaneously from accessible side of the motor.

KIMBLE ELECTRIC COMPANY.

The Kimble Electric Company, Chicago, Ill., has ready for the season of 1911 a complete line of constant and variable-speed polyphase alternating-current ventilating fans and variable-speed single-phase alternating-current ventilating fans. Both of these types are shown in the accompanying illustrations.

The motors of the constant-speed fans are well inclosed, making them especially well adapted for use in dirty and smoky places, such as kitchens, foundries, etc. They are very quiet running and are well constructed in every particular.



KIMBLE POLYPHASE VENTILATING FAN.

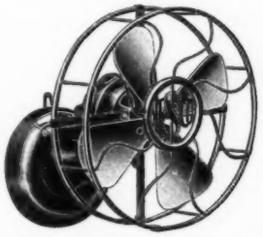
The variable speed polyphase fan permits of regulating the speed so as to secure the ventilation desired. These fans are equipped with the Kimble controller and rheostat. The rheostat is constructed of a single piece of wire without joints.

The variable-speed single-phase ventilating fans are set in a sufficiently heavy cast-iron frame, all in one piece. To reverse the fans it is only necessary to pull down on one or the other of the two pendant chains with which it is equipped. Thus, with the same fan, the

foul air can be forced out or the fresh air drawn in at will. All types of fans are supplied either with the Blackman or aluminum-type blade in sizes ranging from eighteen to thirty-six inches. The motors for all types range in size from one-sixth to one and one-half horsepower and all are sold under the Kimble guarantee.

MANHATTAN ELECTRICAL SUPPLY COMPANY.

Among the direct and alternating-current desk and bracket fans of all sizes being offered by the Manhattan Electrical Supply Company, New York, N. Y., for the season of 1911, are two



MANHATTAN DIRECT-CURRENT BRACKET FAN.

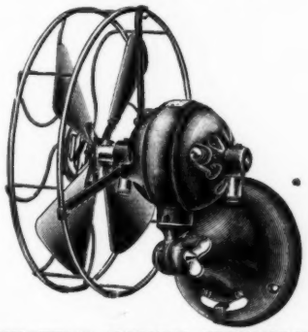
battery fan motors adapted for use in connection with primary batteries.

The "Mesco, Jr.," battery fan motor is furnished with eight-inch fan and guard and a battery box containing twelve cells of Red Seal dry battery connected in "compound multiple series" with ten feet of connecting cord. The fan has three speeds controlled by the switch lever in the base of the

MANHATTAN "MESCO" DESK FAN—SIXTEEN-INCH SIZE.

motor. With new batteries the speeds are approximately 900, 1,250 and 1,600 revolutions per minute. If run on low speed at first changing to high speed as the batteries deteriorate from use, a set of batteries will give about forty hours' service when run eight hours per day, or if run two or three hours per day will give double the number of hours service. The "Ideal" battery fan-motor outfit consists of the Ideal battery motor with a nine-inch brass fan and guard and four type S Edison batteries, inclosed in a neatly finished wooden box. The four batteries on one charge will, according to the manufacturers, operate the fan for about 150 hours.

In addition to these battery fans the Manhattan Electrical Supply Company is offering a complete line of direct-current and alternating-current desk and bracket fans, both oscillating and non-oscillating, in eight, twelve



MANHATTAN "MESCO" SIXTEEN-INCH FAN.

and sixteen-inch sizes. Also alternating and direct-current ceiling fans.

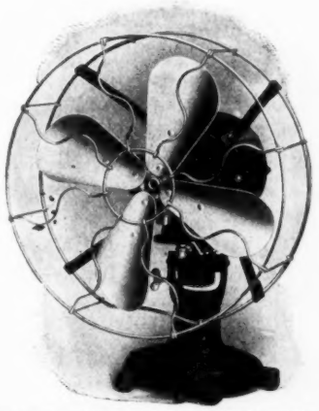
PEERLESS ELECTRIC COMPANY.

The new offerings of the Peerless Electric Company, Warren, O., in electric fans for the season of 1911 include alternating-current desk and bracket fans in eight, twelve and sixteen-inch sizes, of the universal type as well as universal-type oscillators. Other Peer-

MANHATTAN EIGHT-INCH FAN.

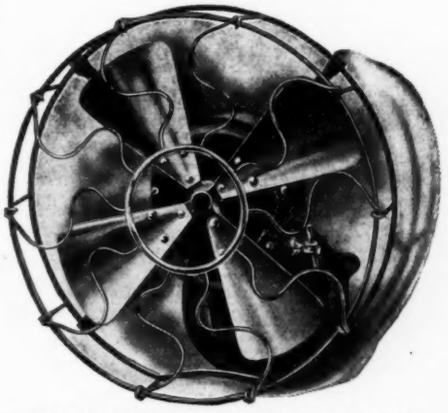
less fan motors for 1911 are of practically the same general appearance as during the season of 1910, embodying, however, a number of minor changes, so as to increase the efficiency and better the mechanical features.

The direct-current line of Peerless fans comprise types EE, ODD, HH and CC, the latter two being ceiling fans. Type EE is furnished in eight, twelve and sixteen-inch sizes. The eight-inch fan, which was first offered last season, weighs less than five pounds, is attractive in appearance and a substantial, durable motor. This fan is suitable for desk use, telephone booths, hotel rooms and residences. For telephone booths, an ornamental spring suspension is provided to take care of any vibration. This type fan may easily be



PEERLESS TYPE FF ALTERNATING-CURRENT OSCILLATOR.

converted into a bracket fan without the use of tools. The type ODD is a positive-drive oscillator and embodies a number of improvements over last year. In general appearance it resembles the type EE and has the same devices for changing from desk to bracket position.



PEERLESS BRACKET OSCILLATING FAN.

The oscillating mechanism is simple, positive and of approved mechanical principle. The scope of oscillation is 110 degrees, but it is an easy matter to reduce this by changing a single adjustment. The oscillator operates equally well in either desk or bracket position. The motor is carried on ball bearings, has a three-speed switch and extra stiff guards and braces. These fans are

available in twelve and sixteen-inch sizes.

In the accompanying illustrations are shown two types of Peerless alternating-current fans. The eight-inch size, known as Type AA is for service on sixty-cycle alternating-current and is identical in external appearance with the direct-current fan. It is a quiet running motor, attractively finished in black enamel with solid brass guards and blades. Though less than five pounds in weight, it is built as substantially as the larger fans, and has a swivel-and-trunnion with universal adjustment for desk or bracket position. This fan is extremely efficient, consuming but eighteen watts at greatest speed. Three-speed switches allow a range from 1,500 to 2,000 revolutions per minute. For service in telephone booths, the fan is equipped with spring suspension to absorb vibration.

The Type BB alternating-current universal fan is of the induction type, single-phase, self-starting. This fan is said to be very efficient in operation, the current consumption at full speed being thirty-five watts for the twelve-inch size, and seventy watts for the sixteen-inch size. The hardened-steel shafts used are ground to exact size, the bearings are of phosphor bronze and liberal in dimension. The rotor is of laminated steel disks, specially ventilated, in which are embedded bare-copper conductors. The motors can be operated through a range of frequency or voltage five per cent above or below normal, but the sum of the two variations should not exceed five per cent. The fan is finished throughout in black enamel, except that blades, guards and oil cups are polished brass.

The Peerless alternating-current oscillator, known as Type FF is a single-phase, self-starting induction motor, externally resembling the direct-current oscillating fan. Like the latter it has the universal swivel-and-trunnion device so that it can easily be changed from desk to bracket position. The oscillating mechanism is positive, having worm-gear reduction. This fan is made in twelve-inch and sixteen-inch sizes having a current consumption, at full speed, of forty and seventy-five watts, respectively.

PENNSYLVANIA STORAGE BATTERY COMPANY.

An improvement in portable fans is offered to the trade by the Pennsylvania Storage Battery Company, Philadelphia, Pa., in the portable storage-battery fan, a view of which is shown in the accompanying illustration. As may be seen, this combination is of attractive appearance and can be used in any room without sacrificing harmony of decorations. The fan, either nine or twelve inches in size, is the regulation electric fan, fitted with specially constructed motor, simple in design and said to be absolutely noiseless and efficient in operation.

The portable storage-battery for these fans is inclosed in an attractively decorated porcelain jar. The cost of charging this battery is estimated at fifty cents and the fan is guaranteed to operate for a minimum of fifty hours on one charge of the battery.

PENNSYLVANIA STORAGE-BATTERY PORTABLE FAN.

The portability of this fan is evidenced by its weight which is only thirty pounds, complete, for the twelve-inch size and twenty-five pounds, complete, for the nine-inch size.

THE ROBBINS & MEYERS COMPANY.

Of especial interest among the line of Robbins & Myers (Springfield, O.) Standard fans for the season of 1911 are the direct-current swivel-and-trunnion desk and bracket fans, oscillating fans, of both the self-starting and gear types, and the alternating-current swivel-and-trunnion and oscillating fans of the same type.

The direct-current swivel-and-trunnion fan is known as model 15 and supersedes model 4. In the construction of this fan the same high class motor, workmanship and finish that have been identified with the model 4 are being maintained with additional improvements. All parts are liberally proportioned and substantial throughout. The bearings are large, and being provided with improved wick oilers, containing ample lubrication, are very durable. They are convertible into wall bracket fans without the use of an adapter. A positive, rigid, vertical adjustment of the body in different positions is secured by a strong wing screw which passes through a slot in the yoke and screws into the body.

The switch base of this fan is large and made of a special insulating material which has both dielectric and mechanical strength. The switch lever works over a cam and takes a positive position for each speed, so that it cannot bridge two contact points at the same time. The speed regulating coil is mounted on the switch base and is held by screws.

The fan blades are designed so as to give the maximum air displacement with a minimum amount of power consumed. They are made of a good grade of sheet brass and are riveted to a punched steel carrier which is formed to give a uniform pitch to each blade. The guard is strong and durable. Its supporting ring consists of a square brass stock to which the cross wires are riveted. The blades are of twelve-inch and sixteen-inch size.

The alternating-current swivel-and-trunnion fans, known as Model W-8, are also available in twelve-inch and sixteen-inch sizes. These fans are of the single-phase, centrifugal-switch, self-starting induction type and are thoroughly well designed, along the lines of the direct-current fans.

The oscillating fans of the self-starting, vane type for both direct and alternating-current are known as model 10. This fan is self-starting in all positions, as well as being convertible from a desk to a bracket fan without the use of tools or any other extra attachment. The fan is equipped with a worm-wheel operated with a thumb piece, so that the plane through which the fan swings may be adjusted by hand to a depressed or an elevated position of any angle desired. This adjustment applies to the fan used either as a desk fan or as a bracket fan.

The oscillating movement will begin automatically whenever the fan is start-

ed, no matter in what position the fan may be stopped. The reversing movement operates perfectly at any speed of the fan, a speed regulation being obtained with the use of the switch and speed regulator in the base, which also serve to start and stop the fan. Since the swinging portion of the fan is perfectly balanced within its yoke, the oscillating movement is also independent of the angle at which it may be inclined. The model 10 direct and alternating-current fans are similar in appearance and finish and all parts are interchangeable except the armatures, fields and speed-regulating coils.

A new fan which the Robbins & Myers Company is placing on the market this year is the universal oscillating gear-type desk or bracket fan. These fans are for both alternating and direct-current and are known as model 11.

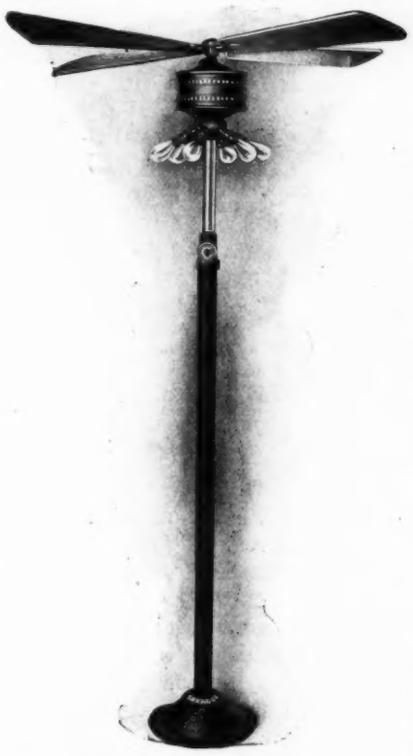
The reduction mechanism consists of a double worm and wheel train inclosed entirely in an oil-proof box and moving the fan from side to side by a crank disk and pitman operating in a horizontal plane.

The Robbins & Myers alternating-current swivel-and-trunnion desk or bracket fans are known as Model 14 and are made in twelve-inch and sixteen-inch sizes only. The general construction of these fans are essentially the same as those already described.

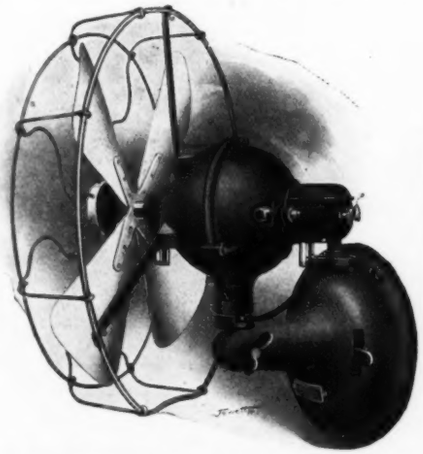
SPRAGUE ELECTRIC COMPANY.

Lundell Fans, which were the first successful electric fans placed on the market, still maintain their popularity and are kept up to date in every detail of electrical and mechanical improvements. One of the changes this season is the strengthening of the guard of the sixteen-inch fan at the motor body by an additional screw in each of the guard straps.

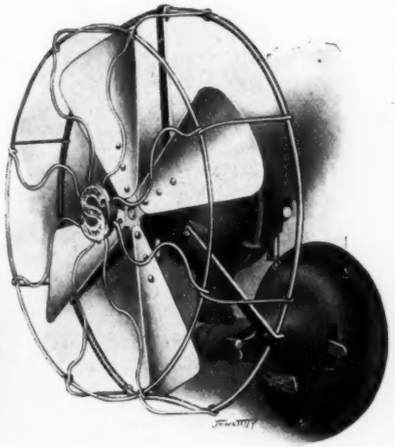
Lundell Fans are made in two sizes, twelve and sixteen-inches and in both oscillating and non-oscillating types. The non-oscillating fans for seasons of 1909, 1910 and 1911 may easily be changed into an oscillating fan by the attachment of a special oscillating-mechanism outfit.



SPRAGUE COLUMN FAN.



SPRAGUE SIXTEEN-INCH OSCILLATING BRACKET FAN.



SPRAGUE TWELVE-INCH BRACKET FAN.

The Lundell oscillating fans are exceptionally well designed and constructed. The worm-gear mechanism, which is entirely incased within a dust-proof enameled iron casing, is not subjected to any perceptible wear and tear, inasmuch as it operates under thorough lubrication, and is constructed of large and generous proportions. No fine gears are used. This gives the oscillating mechanism of these fans exceptional durability.

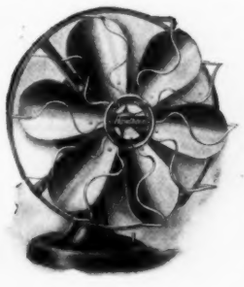
The oscillating mechanism is controlled by an indicator knob mounted at the rear of the gear casing. Through the control of the indicator knob, the fan can be made to oscillate, or to become locked in a stationary position. Simple instructions are attached to each outfit when shipped.

The degree of oscillation, and the degree of downward pitch of the fan blade is uncommonly great. The oscillating movement afforded as a desk or bracket fan is approximately 100 degrees, while the deflection downward as a bracket fan is approximately 100 degrees, and as a desk fan is approximately twenty-five degrees.

WESTERN ELECTRIC COMPANY.

To the already large list of "Western Electric Hawthorn" electric fan motors five new types have been added, and the line is now such that it will meet every requirement necessary to good ventilation.

The most important addition to the line is a new mechanically-operated oscillating fan. The oscillating device consists of a double-worm reduction controlled by an oscillating lever. The gears are inclosed in a dust-proof case which is filled with lubricant. Tool steel is used for the worms and phosphor bronze for the worm heels, thus insuring long life for the mechanism. In this fan the much desired trunnion feature is retained, thus making a wide adjustment in the vertical plane possible when the fan is used either as a desk or a bracket type. The oscillating motion is very smooth and even, and wholly free from jarring. The range of



WESTERN ELECTRIC SIXTEEN-INCH DESK FAN.

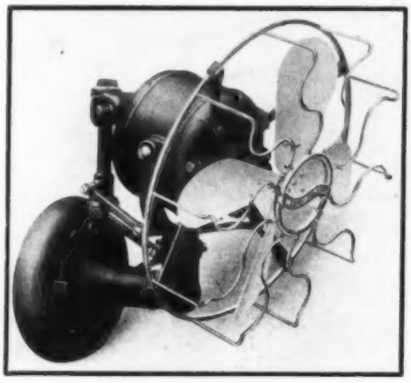
oscillation is ninety degrees and is adjustable.

The success of the twelve-inch, alternating-current, six-blade residence fan introduced last year has led the company to place on the market this same style of fan for use on direct-current circuits and also an oscillating fan of the six-blade type. As the increase in the number of blades allows the speed to be cut down without any decrease in the volume of air moved, this fan operates noiselessly, and because of this fact has become very popular. It can be adapted for use either as a wall or bracket type and has two speeds.

The line of "Western Electric Hawthorn" fans now consists of eight-inch, twelve-inch and sixteen-inch desk and bracket fans; twelve and sixteen-inch oscillating fans; eight-inch telephone-booth fans; air operated and mechanically-operated oscillating fans, and a full line of battery fans, ceiling fans, column fans and exhaust fans for all commercial voltages. These fans are made in various sizes for use on all standard commercial circuits, both alternating current and direct current.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

The 1911 line of fan motors of the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., includes all of the types furnished in 1910, with the addition of several new designs. The fans built by this Company now include alternating and direct-current fan-motors for all purposes—desk and bracket fan motors of the swivel-and-trunnion, mechanically-operated oscillating and air-operated oscillating types with twelve-inch and sixteen-inch blades; twelve-inch six-blade residence-type fan motors; eight-inch desk and bracket fan motors; eight-inch telephone booth fan motors; a complete line of ceiling, counter-column and floor-column fan motors; and twelve-inch and sixteen-inch exhaust fan motors with either Westinghouse standard or Blackman blades. The alternating-current fan motors are designed for 25, 30, 40, 50, 60 and 133 cycles, 110 or 220 volts; the direct-current fan motors are designed for 30, 50, 110 or 220 volts, except the ceiling and column types which are not built for the battery voltages.



WESTINGHOUSE MECHANICALLY-OPERATED OSCILLATOR.

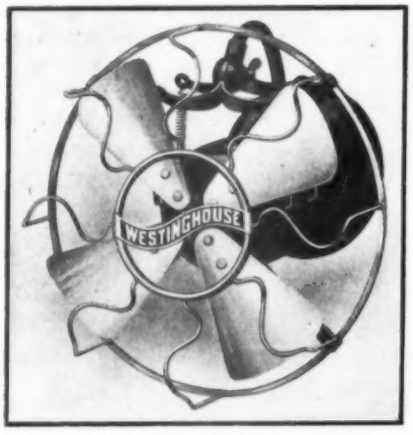
The twelve-inch and sixteen-inch desk and bracket swivel-and-trunnion fan motors are adjustable through a wide angle and are clamped firmly in any position. An adapter is furnished for bracket use, which can be inserted between the motor body and the base of the fan without opening the circuit.

The twelve-inch and sixteen-inch mechanically-operated oscillating fan motors are an addition to the Westinghouse line. The fan is of the same construction as the swivel-and-trunnion type, having a wide adjustment above and below the horizontal. The oscillator mechanism consists of a double-worm reduction and a single oscillating lever. The gears are inclosed in a case packed with grease. The arc of oscillation is adjustable within ninety degrees. These fans can be quickly arranged for wall mounting by means of an adapter similar to that used with the swivel-and-trunnion fans.

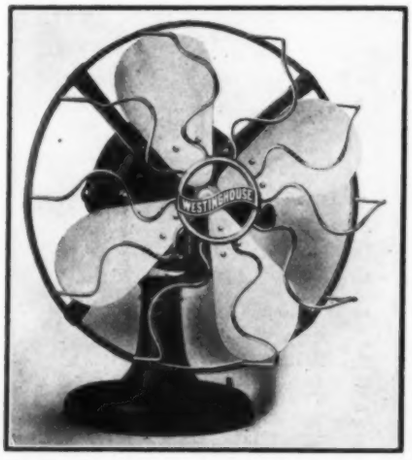
Air-operated oscillating fan motors are still furnished in twelve-inch and sixteen-inch sizes for use where oscillation in the horizontal plane is sufficient.

The Westinghouse twelve-inch residence fan motors are particularly applicable for hospitals, libraries, sleeping rooms or other places where quiet is essential. The fans operate at low speed but have six blades set at a high pitch instead of four. Otherwise they are the same as the desk and bracket types.

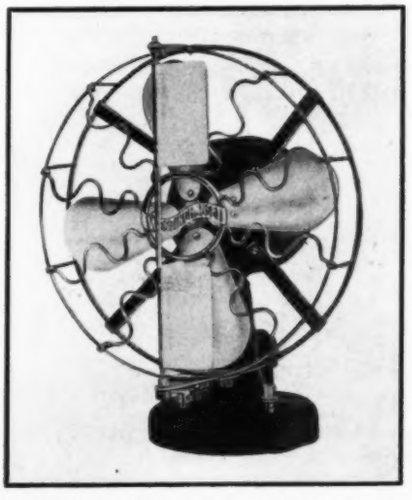
The eight-inch desk and bracket fan motors have become very popular for use where the strong breeze of a large fan is undesirable. The bodies and bases of these motors are of pressed sheet metal, finished in black oxide, mottled copper, polished brass or brushed brass, and present a very attractive appearance. The sixty-cycle, 110-volt motors of this type can be used with a special converting base on 25 to 50 cycles or on direct current of the same voltage. A swivel arrangement in the base makes it possible to mount the fan either in a vertical position or on the wall, and makes vertical angular adjustment possible.



WESTINGHOUSE EIGHT-INCH TELEPHONE-BOOTH FAN.



WESTINGHOUSE ALTERNATING-CURRENT DESK FAN.



WESTINGHOUSE AIR-OPERATED OSCILLATOR.

Current Electrical News

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., MARCH 4.—It is stated that the first consignment of electric power, from the new plant of the Canadian Power Company, of Montreal, amounting to about 20,000 horsepower, wil be ready for distribution near the middle of April next, and it hoped that an equal amount of power will be available before August 1, so that the company will be in a position to generate close on 40,000 horsepower at that time.

The Shawinigan Water & Power Company, of Montreal, which generates power at Shawinigan Falls, Que., is asking the Quebec Legislature for authority to change its charter, so that after the whole of the capital stock authorized has been fully paid up, the capital stock of the Company may be increased, from time to time, to an amount not exceeding $20,000,000, instead of ten millions, as the law now is.

It is stated that the city of Toronto will shortly float a loan of $1,000,000 to meet the cost of installing the hydroelectric system in the city. So far about $700,000 has been spent upon the system, within the city limits. This was secured by local loans. Two years ago the city secured authority to issue debentures for $2,750,000 for the installation of the system.

An important amendment to the Ontario Hydroelectric Power Act is now under consideration by the Hydroelectric Commission. By this amendment provision will be made to supply farmers directly with electrical power at their homes. It is not improbable that the measure under consideration may be introduced at the present session of the Ontario Legislature. It is expected that a test of power for farm work will be made at the Ontario Agricultural College.

It is pointed out that if the Georgian Bay Canal scheme goes through, as it now undoubtedly will, the Ottawa district will be in for a remarkable development of electric power which would be available at exceedingly cheap rates. The total amount estimated is 2,000,000 horsepower, and while much of this gigantic development is near the city of Ottawa, all of it is within a radius sufficient to insure economic transmission. The Dominion Government will make at the present session of parliament an initial appropriation for the commencement of the work.

The huge bulk of 59,659,776,000 cubic feet of water will be stored on the head waters of the Ottawa River, when the conservation dams, now being constructed by the Dominion Government, have been completed. Two of these big works, at Kippewa and Temiskaming Lakes, will be finished during the present year, and one at Quinze Lake next winter. The waters controlled or retained by the dams will cover an area of 331 square miles, and the Ottawa River, throughout its entire length down to Montreal, will be given an even flow of water for power purposes throughout the whole year by conserving the spring floods.

The Canadian Pacific Railway Company has decided to still further increase the method of train dispatching by telephone over its system, and authority has been given for the equipment of 1,528 miles additional this year. This will make a total of 3,782 miles of telephone train dispatching circuits on the road, covering the line from Kamloops to Calgary; Medicine Hat to Winnipeg; Fort William to Ottawa and Brockvill; Sault Ste. Marie, Mich., via Sudbury to Toronto; Windsor to Smith's Falls; St. Thomas, Port Burwell and St. Mary's branches; Quebec to Montreal; Montreal to Newport, Vt., and St. John, N. B., and the Temiskaming branch.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, CAN., March 3.—Rural telephones are arousing interest amongst the farmers of Western Canada, and large gangs are employed in the three western provinces keeping up with the applications. To cope with the situation the Department of Telephones at Regina, Saskatchewan, has drafted the following set of rules: (1) Applications must be signed personally by the person desiring a 'phone; (2) regulations call for one 'phone subscriber per mile of line to be constructed; (3) average of one subscriber per mile not to include renters of 'phones; (4) houses where 'phones might be located are to be marked on map of proposed line and information supplies as to any persons in the vicinity likely to need a 'phone in the near future; (5) minutes of first meeting held appointing officers, etc., must be forwarded with the application; (6) rural systems will be permitted to connect with one business center only; (7) directors of rural lines must be bona fide residents of the district in which the line is to be installed.

There are also other rules regarding the financing and management of these companies and this set of regulations is being strictly adhered to by the farmers starting rural systems in Saskatchewan and almost daily applications are being received for rural telephone lines.

The municipal telephone system at Port Arthur, Ont., was operated at a loss during 1910, according to a report made to the municipal commissioners by M. O. Robinson, the manager of the system. His figures show that a deficit of fifty cents per telephone exists and recommended an advance in rates of $1.00 on each residential telephone. This report was adopted and the increase ordered.

Agitation for a more frequent street car service on the municipal system in Fort William, Ontario, resulted in a statement from the manager of the system to the effect that more power is required before such can be attained. The City Council therefore agreed to call for tenders for a 600-kilowatt generator.

The latest telephone directory issued for Moosejaw, Saskatchewan, shows exactly 1,000 telephones, an increase of 127 over a year ago.

The City Council of Calgary, Alberta, has ratified bylaws providing $60,000 for a conduit system for electric wires and 380,000 for electric light plant and wiring in the city. Tenders for the work will be called shortly.

At Southey, Saskatchewan, the Buffalo Lake Rural Telephone Company has been organized and plans are now being made for the immediate construction of fifteen miles of pole line.

The British Columbia Telephone Company has completed its $30,000 telephone exchange in North Vancouver, British Columbia. It is now in operation.

The Kronau Rural Telephone Company has been organized at Kronau, Sask., with J. W. Irwin as secretary-treasurer. Plans are now being completed for the immediate construction of thirty-five miles of pole line and further extensions will be made as soon as these are completed and in operation.

Work is being rushed on the new exchange at Mount Pleasant, B. C., for the British Columbia Telephone Company and the announcement is made that it will be completed early in April. Despite the unfavorable weather the company has already strung 50,000 feet of aerial cable in connection with the new exchange, and before it is completed will have as much more strung. In all 1,300 poles are to be set up and up to the present some 700 have been placed. The exchange when completed, apart from the switchboard, will cost $40,000. Incidentally the company is planning a large expenditure for the present year in extensions and new lines, as well as for some dozen or more new exchanges.

G. R. G. Conway has been appointed chief engineer of the British Columbia Electric Street Railway Company, with headquarters at Vancouver, British Columbia. Mr. Conway was sent out from London, England, by the British directors after he had made a name in British street railway circles.

A government report shows that there are now more than 3,500 telephones in the City of Calgary, Alberta, an increase of 500 since the last directory issued by the provincial government. There are now approximately 800 subscribers in the west automatic district, 175 in the east automatic district and 2,500 in the manual exchange.

Rural telephones are prospering in Saskatchewan, for there are now 189 rural systems in the province and a dozen or more applications are being received weekly.

LIGHTING AND POWER.

(Special Correspondence.)

MOBRIDGE, S. D.—Smith & Hill have applied for an electric light franchise here. P.

BURLINGTON, MO.—This city has voted electric light bonds to the amount of $8,500.

DALLAS, S. D.—The Dallas Light, Heat & Power Company has been granted a franchise. P.

WAUBAY, S. D.—Boyle & Weller, of Webster, have asked for an electric light franchise here.

MONTICELLO, ARK.—This city will rebuild the electric light plant which was recently burned. P.

OLDHAM, S. D.—A new electric light system has been completed and placed in operation here.

OAKES, N. D.—A franchise has been granted to Earnest Marshall to install an electric light plant. C.

ELLENSBURG, WASH.—Nearly $3,000 will be spent by the city in improving the municipal light plant this year.

HEAVENER, OKLA.—The Degna-McConnell Coal Company has applied for an electric light franchise.

LOMIRA, WIS.—The Lomira Electric Light & Power Company

has incorporated with a capital of $12,000. The incorporators are P. J. Zeddler and others.

LAVINA, MONT.—B. F. Fullmer, of Lewiston, Mont., is preparing to install an electric light plant. C.

KIRBEYVILLE, TEX.—J. W. Flemming and Julius Morton will soon install an electric light plant here.

BONDUEL, WIS.—Dietrich & Brandt, proprietors of the roller mills, will put in an electric light plant.

ABBEVILLE, LA.—A system of street lighting making use of tungsten lamps has been installed here.

TYNDALL, S. D.—The new electric system at this place is being pushed to completion as rapidly as possible.

HAYTI, S. D.—S. M. Ellis and J. A. Snyder, of Watertown, are planning the installation of an electric light plant. C.

HILL CITY, S. D.—The Hill City Lumber Company is erecting a building for the installation of an electric power plant. C.

SPOONER, WIS.—The council has voted to buy a site on the Namekagon River for the construction of a power plant. C.

CAMAS, WASH.—The Northwestern Electric Company has been granted a franchise to furnish this city with electric light. A.

MARIONVILLE, MO.—The Lawrence County Water, Light & Cold Storage Company has secured an electric light franchise.

NEWPORT, CAL.—This city is about to issue $55,000 worth of bonds for the erecting of an electric lighting system here this year. A.

MINOT, N. D.—Burns & McDonnell, of Kansas City, Mo., are investigating the feasibility of installing a municipal electric light plant. C.

WEBSTER CITY, IOWA.—The council has plans for the erection of a fireproof electric light plant estimated to cost about $12,000. C.

BARABOO, WIS.—City Engineer French has prepared plans for the construction of an electric light plant estimated to cost $45,000. C.

CHAPPELL, NEB.—At a recent election the proposition of erecting a municipal electric light plant was carried by a large majority.

DAYTON, WASH.—The Dayton Electric Company has applied for a franchise to conduct an electric lighting and power system in this city. A.

SPRINGFIELD, ORE.—The Oregon Power Company is to supply this city and Junction City, Ore., with electric power for lighting purposes. A.

IMBODEN, ARK.—The electric light plant here has been leased by J. W. Philpot, who will make many improvements and begin operations at once.

EAGLE POINT, ORE.—An electric lighting plant is to be erected on the Little Butte Creek near here to supply this town with light and power. A.

SENTINEL, OKLA.—Property owners will vote on the issuance of bonds to the amount of $12,000 for the purpose of building an electric light plant.

ARKADELPHIA, ARK.—The electric light and water plant here which was owned by J. W. Wilson has been sold by his executors to W. P. Wilson.

HOUSTON, TEX.—The Sunset Heights Water, Light & Power Company has been incorporated for $20,000 by Richard Rodgers, B. R. Harden and others.

GRIGGSVILLE, ILL.—The City Council has granted a twenty-five year franchise to the Union Electric Service Company to operate an electric lighting plant. Z.

CANYON, TEX.—The Canyon Power Company has incorporated with a capital of $25,000. The incorporators are C. R. McAfee, C. N. Harrison and D. A. Park.

JEFFERSONVILLE, IND.—The United Gas & Electric Company has announced that it will expend $30,000 in improvements and extensions of the system. S.

TROUTDALE, ORE.—A new power house is to be built one mile west of this city, on Multnomah Farm, for the better supplying of Multnomah with electric power. A.

METALINE, WASH.—The construction of a 10,000-horsepower electric light and power generating plant on Sullivan Creek is projected. The cost is to be $350,000. C.

ATLANTIC CITY, N. J.—The Atlantic City Electric Company has received permission to issue $10,000 in first and refunding mortgage five per cent gold bonds.

STREATOR, ILL.—The contract for the erection of the new substation here for the Illinois Valley Gas & Electric Company has been let to Phillip Schlachter of this city. Z.

ALBERTVILLE, ALA.—An additional $7,000 worth of bonds will be used to establish an electric light plant here. The plant is to be connected to the water works plant.

NORTH YAKIMA, WASH.—This city will probably own its lighting plant in about a year. A fight for rate reduction which is looked for at that time may precipitate matters.

WATSONVILLE, CAL.—The Coast Counties Light & Power Company is planning to extend its line in Green Valley three miles to the Litchfield, about seven miles from this city. A.

SEATTLE, WASH.—The contract for the construction of the Nisqually power plant was let to Hans Peterson, of Seattle, the only bidder, on his bid of $1,074,918. C.

MANCHESTER, IOWA.—The plant of the Manchester Light, Heat & Power Company is to be enlarged and new machinery will be installed. It is estimated that $4,000 to $5,000 will be expended.

SOMERSET, KY.—The United Water Light & Traction Company has been incorporated with a capital of $100,000. The incorporators are C. F. Smith, B. L. Waddle, A. A. Tuttle and M. O. Curd.

SAN FRANCISCO, CAL.—The Sierra Nevada Water & Power Company has been incorporated by A. W. Wright, Frank Smith and E. McGettigan, all of this city, with a capital stock of $25,000. A.

SYLVANITE, MONT.—The Milwaukee Electric Power Company has been incorporated for the purpose of developing electric power on the Yakh River for the Sylvanite mines and other industries. C.

MANGUM, OKLA.—Extensive improvements are being made in the lighting plant here and there is a field for a much greater expansion of business. A considerable amount of decorative street lighting will be done.

AMBERG, WIS.—Syl Duquaine, of Green Bay, H. S. Duquaine, of Crivitz, and H. I. Norton, of Marinette, are organizing a company, with a capital of $100,000 to develop the water power at Davis Falls on Pike River. C.

FERGUS FALLS, MINN.—L. P. Wolfe, engineer, St. Paul, has prepared three plans and estimates for the reconstruction of the city dam which was washed out recently, one of which is estimated to cost $91,000 and the other two, $72,000 each. C.

GREENVIEW, ILL.—The Greenview Electric Light & Power Company has been incorporated with capital stock of $10,000, to conduct a light, heat and power plant. The incorporators are John Larson, James A. Bracken and Alvin H. Cleveland. Z.

LOGAN, W. VA.—The Logan Electric Company has been incorporated to erect and operate power plants. The capital stock is $25,000. The incorporators are W. F. Bevill, Charles Bennett, S. M. Bisant, Naaman Jackson, Frank R. Hurst, all of Logan.

BRAINERD, MINN.—The National Light, Heat and Power Company is the name of the corporation which will supply the city of Brainerd with electric light and power for the term of ten years, as contracted for by the Toltz Engineering Company of St. Paul.

RAVINA, OKLA.—The Ravina Mining & Milling Company has been incorporated for $100,000 by E. W. Rose, of Dallas, Tex., president; J. E. Harris, of Ravina, vice-president, and R. T. Wilkerson, treasurer. The company expects to put in its own power plant.

INDIANAPOLIS, IND.—The Mars Hill Realty Company, of which John N. Cary is president, announces a readiness to contract for the erection and equipment of an electric light and power plant in Mars Hill, a new industrial city adjacent to Indianapolis. S.

LANSING, MICH.—The State Railroad Commission has approved the proposed issue of $1,250,000 in bonds by the Economy Power Company to be used for acquiring the Flint and Kalamazoo power plants and the development of the Au Sable water power system.

CLEVELAND, O.—The Whitney Power Company has been incorporated to supply light, water and power to office buildings. The capital of the company is $50,000, and its incorporators are W. B. Whiting, C. C. Owens, Ellis R. Diehm, T. M. Kirby and Donald McBride.

IMPERIAL, CAL.—C. S. Chestnut of Redlands, has presented to the city a proposal to build and have in operation within five months, an electric lighting plant, if the city will grant a contract to the company for lighting the streets at a rate not greater than the present rate. A.

NEEDLES, CAL.—E. H. Rose, of Los Angeles, has purchased the Needles Light & Power Company and plans to improve the plant this year, both by the enlarging of the electric lighting system and the erection of a gas plant to be operated in conjunction with the electric plant. A.

MANCHESTER, IOWA.—Joseph Hutchinson has asked the city for a franchise giving the right to operate and maintain an electric light and power plant. The granting of a franchise is to be submitted to the voters of the city at the times of the city election, to be held March 27.

WASHINGTON, IND.—The Citizens Light & Fuel Company has been incorporated, capitalized at $75,000. The object is to construct and operate a plant to manufacture and distribute electricity and gas. L. P. Boyle, Thomas Burns and Paul M. Taylor are the incorporators. S.

COLUMBUS, O.—Extension of the municipal light plant to provide light for the new districts of the city was provided for in an ordinance introduced recently before the City Council. The measure carried an appropriation of $75,000. It was referred to the committee on finance.

PORTOLA, CAL.—An electric light plant will be installed here as soon as weather permits. The company was incorporated recently with C. H. Gardner, president and D. L. Tyre, vice-president and general manager. On account of the extremely cold winter weather the work was postponed.

GERBER, CAL.—The Gerber Water & Light Company has been incorporated by Edward H. Gerber, George W. Peltier, F. W. Peltier and F. W. Kiesel, all of Sacramento, Cal., with a capital stock of $50,000. Work by the new company will commence, it is stated by the incorporators, early in May. A.

WEBSTER CITY, IOWA.—The City Council here is advertising for bids for a new fire-proof electric light and power plant. It is estimated that the structure will cost about $40,000. Bids will be opened March 21. Work on the new building is to begin May 1 and its completion is called for August 1.

RAPID CITY, S. D.—According to present plans, the new power plant of the Dakota Power Company, located on Rapid Creek, near here, will be completed and ready for operation by September 1. The power plant will contain three 800-kilowatt generators, operated by hydraulic power.

EXCHEQUER, CAL.—Sidney Sprout, consulting engineer for the Exchequer Lighting & Power Company, announces that his company has plans for a new power house in the Merced River Canyon. Mr. Sprout reports that work on the power plant construction will commence in the first part of April. A.

STREATOR, ILL.—Several hundred thousand dollars will be invested by the Illinois Valley Gas and Electric Company in improving its plant here, and in establishing a large power station across the river at Spring Lake. This company will also improve or entirely rebuild its street railway system in this city.

JALISCO, MEX.—The Natividad Mines & Reduction Company announces that it will erect a hydroelectric power plant on the Ameca River this year, capable of generating 800 horsepower, and costing about $150,000. H. L. Little, of Berkeley, Cal., is the secretary of the company. He states that the new plant will be in operation before the end of this year. A.

KOOSKIA, IDAHO.—It is reported that work on the dam here will begin early in June. The dam will be constructed across the middle fork of the Clearwater within the town limits, and the cost is estimated at $200,000. At least 5,000 horsepower will be developed. With the completion of the dam will come a pulp mill, large sawmill and other industries.

REDMOND, ORE.—The Crook County Water, Light & Power Company, which owns a power site at Cline Falls on the Deschutes River, four miles from this city, contemplates building a power plant there within the next six months. The plan is to run a transmission line from the Falls to this city and from the Falls to Prineville, a distance of twenty miles.

SAN MARCOS, TEX.—The San Marcos Utilities Company has been granted a renewal of its electric light franchise by the City Council and the company announces that it will spend at least $10,000 in increasing its equipment in order to meet the demand for an enlargement of its service. It will give a twenty-four-hour service and makes provisions for furnishing power for all purposes. D.

BOISE, IDAHO.—It is stated that a big increase has been made in the capital stock of the Idaho-Oregon Light and Power Company for the express purpose of spending more than $4,000,000 in work on the Ox Bow tunnel, extension of present lines and the building of new ones into other territory, the construction of additional substations, and in prosecution of a general plan of enlargement.

SAN FRANCISCO, CAL.—The City Electric Company has announced that the stockholders who desire to join a pool of not less than two-thirds of the entire stock, may deposit their shares until August first for sale at not less than $80.00 per share. It is reported that H. P. Wilson, representing the Great Western Power Company, has purchased the City Electric Company from Herbert and Mortimer Fleishhacker, who are the principal stockholders. A.

MARTINEZ, CAL.—The Great Western Power Company has applied for a franchise for power lines throughout Contra Costa County. The company's new line will extend from Payton, Cal., down the Bay shore through all the towns there and on to Richmond, Cal., to which a line has already been built from Oakland. The two lines will connect and a circuit through Contra Costa County will be formed. This is the first city to be supplied from the new branch.

KEOKUK, IOWA.—The hydraulic construction, including dam, power house, lock, dry dock and installation of water wheels for the hydroelectric plant of the Mississippi River Power Company, will be under the direction of Hugh L. Cooper, and the electrical construction, including the installation of all electrical machinery and construction of transmission lines under the direction of Stone & Webster Engineering Corporation of Boston. Hugh L. Cooper will be chief engineer. C.

JAMES CITY, PA.—The American Plate Glass Company at Kane, Pa., will add a Westinghouse 700-horsepower horizontal National gas engine to its power plant at James City. The engine will operate on natural gas. The gas engine will be connected to a Westinghouse 625-kilovolt ampere, 600-volt, three-phase, twenty-five cycle, alternating-current generator, which will be used in supplying energy for power and lighting. The new equipment will operate in parallel with other gas-engine driven sets.

LAPORTE, IND.—Articles of consolidation of the Northern Indiana Gas & Electric Company with a capital stock of $5,000,000, have recently been filed. The new corporation is a merger of the South Shore & Electric Company, the Indiana Harbor & East Chicago Electric Company, the Plymouth Lighting Company and the Whiting Electric Light Company, Clarence H. Geist, of Philadelphia, is president; Samuel T. Bodine, vice-president, and Lewis Lillie, secretary.

TAYLOR, TEX.—The Citizens' Light and Power Company of Taylor is installing a 350-horsepower engine in its plant on First and Oak Streets. The additional power was necessitated by the large increase lately in local demand for electric motive power, and particularly the contract entered into with the International and Great Northern Railroad to supply the entire power for operating the motors of the railroad's new Taylor shops. Every piece of machinery in the new shops is operated by individual motor equipment.

SANDUSKY, O.—The war which for some time has been waged here to secure cheaper lighting appears to be nearing an end. The Sandusky Gas & Electric Company, which has held the franchises, has submitted a proposition based upon a rate of eight cents instead of ten cents per kilowatt hour. The company also proposes to furnish arc lights to illuminate the streets for $66.00 a year instead of $77.50 heretofore charged. The proposition came after the initial steps had been taken looking toward municipal ownership of the lighting plant. H.

BEDFORD, IND.—The Bedford Power Company has commenced work on a dam across White River near this city. The object is to generate electricity by hydraulic power, for lighting and power purposes. The Company is also building an emergency plant to be operated by steam power in case of low water. These plants will be equipped with the latest electric apparatus. The plan is to furnish light and power to the numerous stone quarry plants and mills to prepare building stone. The Company expects to transmit power about 100 miles. S.

PORTLAND, IND.—Professor Harding of Purdue University has made a report concerning the condition of the municipal light plant to the City Council. Professor Harding recommends a reorganization of the operating force and the employment of a competent superintendent to have full authority over the plant and its employees. He also recommends the installation of a soft-water feeding device for the boilers, rewiring of the switchboard and renewal of service lines. A few other improvements were likewise recommended. Poor service occasioned the examination of the plant with a view of locating the trouble. S.

SAN ANTONIO, TEX.—At a recent joint meeting of the directors of the San Antonio Gas and Electric and the San Antonio Traction Companies, both of which are owned by the same interests, a budget of $250,000 for proposed improvements to the plants and systems of the companies was adopted. It is stated that the electric lighting department will be improved at a cost of $50,000, exclusive of the reconstruction and remodeling of the power plant at an additional cost of $35,000. Additional boilers and machinery will be installed in the gas plant and other improvements made to that department at a cost of $58,000. Nearly $100,000 will be expended in double-tracking lines of the San Antonio Traction Company. About $50,000 will be expended for additional trolley cars. D.

FARMINGTON, N. M.—The City Council of Farmington has under consideration the proposition of submitting to a vote of the people a bond issue for installing a water works pumping plant and distributing system and a municipal electric light plant. It is stated that the waterworks proposition will be put through, irrespective of what decision is reached as to the proposed lighting plan. In this connection it is announced that the Rockwood Power Company, which has a large electric power plant at Durango, contemplates running a transmission line down the Animas River Valley to Farmington, to furnish power for the irrigation pumps of the farmers and power and lights for the towns of Aztec, Flora, Vista, Kirtland, Fruitland and Farmington. A local company is also being organized to install an electric light and power plant. D.

CORPUS CHRISTI, TEX.—The plan for constructing a dam across the mouth of Nueces Bay is said, by J. E. Franklin, president of the Uvalde & Crystal City Railroad, to be assuming definite shape. The proposed causeway will be about six miles long and from 200 to 250 feet wide across the top in order to accommodate interurban electric railway track, steam railroad, wagon road and automobile speedway. Spillways will be built to take care of the surplus flow of the stream which feeds the bay. Estimates of the cost of the proposed works range from $750,000 to $1,000,000. In addition to affording a perpetual supply of water for irrigating a very large acreage of rich land, the reservoir would give to the city of Corpus Christi a bountiful amount of water for all purposes. In connection with the water storage and irrigation enterprise a hydroelectric plant will probably be installed to provide lights and power for Corpus Christi and other towns. D.

ELECTRIC RAILWAYS.

(Special Correspondence.)

EL PASO, TEX.—The El Paso Electric Street Railway Company will build an addition to its power plant. P.

WATERLOO, IOWA.—The Waterloo, Cedar Falls & Northern Railway Company will expend $100,000 in improvements. C.

MANKATO, MINN.—The Mankato Electric Traction Company will extend its line down to Willard Street during the present year. C.

FRUITA, COLO.—An electric lighting franchise has been granted to the Grand Junction & Grand River Electric Railway Company. P.

IOWA CITY, IOWA.—The Iowa City-Cedar Rapids Interurban Railway Company is planning the construction of an electric line to Muscatine. C.

TAMA, IOWA.—It is proposed to extend the Oskaloosa-Tama interurban line to Waterloo, by way of Toledo. L. J. Tutt is manager of the company. C.

KEOKUK, IOWA.—As soon as the right of way is secured the McKinley syndicate will construct an interurban to Argyle, St. Francisville and Kahoka. C.

MADISON, WIS.—The Chicago & Wisconsin Valley Street Railway Company will shortly commence the construction of its interurban line to Portage. C.

SAN DIEGO, CAL.—The San Diego Electric Railway Company plans the extension of its lines to Escanto Heights, and also the extension of the M Street car line.

KOKOMO, IND.—It is reported that work will soon be begun by the Kokomo, Marion & Western Traction Company on a thirty-mile extension from Kokomo to Frankfort. S.

EAST LIVERPOOL, OHIO.—The Tristate Railway and Electric Company has been incorporated with capital stock of $10,000. The incorporators are W. J. Shelp and others. Z.

LEHIGH, IOWA.—The Fort Dodge, Des Moines & Southern Interurban Company will construct a short extension to Gowrie to connect with the Crooked Creek Steam line. C.

SEATTLE, WASH.—The proposal to issue bonds for $800,000 for the construction of a trunk trolley line in the South Ward has been ordered by the South Ward Progressive Club. C.

SAN RAFAEL, CAL.—George D. Shearer has again asked for a franchise for an electric street railroad in this city. Mr. Shearer applied for a franchise last year, but withdrew it voluntarily. A.

VALLEJO, CAL.—President T. Gregory, of the Vallejo & Northern Electric Railway Company, has applied for a fifty-year franchise over the tidelands leading to the wharf of the Monticello Steamship Company.

SOUTH BEND, WASH.—President J. O. Crary of the Twin City Electric Company has accepted the street railway franchise offered by the city, for an electric carline on the streets and alleys of this city.

FOSTORIA, O.—The council of the recently incorporated village of Burgoon has granted a franchise to The Fostoria & Fremont Railway Company for the use of such streets as it may require for its tracks.

SAN ANTONIO, TEX.—J. A. Logwood, of San Antonio, and associates have sold their interurban electric railway that they were constructing between San Antonio and San Jose to A. D. Powers, and the latter will complete the line. D.

SAN BERNARDINO, CAL.—The Southern Pacific Railroad Company plans to electrify the road between this city and Upland and to build a through line from Santa Ana to Colton. Work on both these improvements is expected to begin in about six weeks.

DALLAS, TEX.—The Dallas Street Railway Company has been incorporated with a capital of $20,000 for the purpose of maintaining and operating street railways and suburban railways at Dallas. The incorporators are: George W. Works, W. Leslie Williams and A. C. Moser.

LOS ANGELES, CAL.—The Los Angeles Railway Company has applied for a franchise for a cross-town carline. Two routes have been submitted; one from Fourth and Vermont to the east City limits, the other on Vermont to Jefferson east to Central, south to Vernon and east to the City limits. A.

TULSA, OKLA.—Chas. Page has been granted a franchise for an interurban railway to be built from Tulsa to a large amusement park, which will be built by him. The Sands Springs Interurban Railway Company, another local concern, has been incorporated for $20,000 by Charles Page, W. E. Rhodes and others.

PITTSBURG, PA.—The West Penn Railways Company may shortly announce its plan for extensions and improvements. These will probably include the laying of about fifty miles of new track and the construction of a number of additional power houses. The report follows a recent inspection trip of Pittsburg bankers.

NEW HAVEN, CONN.—The Shore Line Electric Railway Company, which is constructing a part of its main line between Guilford and New Haven and operating the rest of its system east of Guilford, has purchased a tract of land on Middletown Avenue in this city for a terminal building which it will shortly build.

POTTSTOWN, PA.—Pottstown is to be connected by trolley with Royersford, Spring City and Phoenixville, if the present plans of C. Taylor Leland are out. The link between Pottstown and Spring City, via Royersford, will be built the coming spring, and will connect with the Pottstown & Reading Company's track at Sanatoga.

PETALUMA, CAL.—The Petaluma & Santa Rosa Railroad Company has been granted a franchise to operate an electric street car line in this city. The company agrees that if the road is not completed to Point Pedro within four years from the date of granting, and connected with the ferries running to San Francisco, the franchise shall be forfeited. A.

HAYWARD, CAL.—I. B. Parsons, president of the Bank of Hayward, has been granted a franchise for an electric street railway to run from the Southern Pacific Railroad Company's station, via Front, C, Commercial and B streets to the city limits. Work on the new line is to commence within three months, according to the terms of the franchise.

CARMEL, IND.—Officers of the proposed Delphi-Carmel traction line met with the Carmel town board and a franchise was granted to build the new line through the main street of Carmel. The line will run through Delphi, Flora, Sheridan, Westfield, Carmel, Broad Ripple, Indianapolis and touch some of the smaller places. The officials say the cars will be running before the end of the year.

KENTLAND, IND.—Mt. Ayr and Jackson townships in Newton County have voted a subsidy tax of one and one-half per cent in aid of the construction of the proposed Indiana and Northwestern traction line, projected by Eugene Purtelle, which is planned to connect Lafayette, Monticello, Rensselaer, Hammond and Chicago. It is stated that men with ample capital have secured control of the enterprise and that work will begin early in the spring. S.

SAN JOSE, CAL.—The San Jose Railroad Company announces that the improvements which are being made on its First Street system in this city, at the cost of $400,000, will be finished within a short time. The system is being broad-gauged over ten miles of trackage. The paving contracts alone amount to approximately $200,000. When this work is completed, the San Jose Railroad Company plans to improve its Alum Rock line, which is now only a single-track road. A.

FORT WAYNE, IND.—The Fort Wayne & Northern Indiana Traction Company has been formed here with a capital stock of $8,000,000 divided equally into common and preferred stock for the purpose of refinancing and taking over the city street railway systems of the Fort Wayne & Wabash Valley Traction Company. Eleven local directors chosen to serve temporarily elected the following officers all of Fort Wayne: President, Henry J. Bowerfind; vice-president, James H. Haberly; secretary, Arthur H. Mohr, and treasurer, Harry E. Vondermark. Z.

KANSAS CITY, MO.—The St. Louis-Kansas City Electric Railway Company has awarded the contract for building an electric railway 140 miles long between Kansas City and St. Louis to the L. J. Smith Construction Company, of Kansas City. Work will begin as soon as the weather permits, probably some time in March. Work will begin at Columbia, Mo., and extend 128 miles to Kansas City. A ten-mile branch from Columbia to Harrisburg in the coal fields will leave the fuel accessible for power plants which it is proposed to build. Extension of this branch to Moberly eventually is planned. The stretch from Columbia should be finished in two years, but the Harrisburg-Kansas City line will be finished first.

FT. WAYNE, IND.—The newly organized Ft. Wayne and Northern Indiana Traction Company has taken over the holdings of the Ft. Wayne and Wabash Valley Traction Company, including the interurban line connecting Ft. Wayne, Wabash, Logansport, Lafayette and Battle Ground, the local street railway lines in each city, and the electric power and lighting plants in Ft. Wayne and Lafayette and deeds of the property are now being recorded in all the counties traversed. A mortgage for $15,000,000 to secure present indebtedness is likewise being recorded. It is understood the new company will also take over the Toledo and Chicago Interurban line from Ft. Wayne to Kendallville and extend the line from Kendallville to Goshen. S.

VALLEJO, CAL.—The Vallejo & Northern Railway Company has made the first step towards changing its proposed route southward from Sacramento to the San Francisco Bay. This follows the action of the company's board of directors who, in a meeting held recently, decidedly to abandon the fight for a franchise in this city, and to adopt another route in preference to the one along Mare Island Channel, where the company has already spent $50,000 buying a tideland right of way. The citizens of Benicia have assured the company of a private right of way and terminal facilities upon deep water, shortening the route to San Francisco by a little more than an hour. It was intended by the Vallejo & Northern Railway Company originally, to create its terminal in this city, building by way of Cordelia, Napa Junction and Vallejo. A.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

TIMBER LAKE, S. D.—C. E. Wright has asked for a telephone franchise in this city. P.

LANESBORO, MINN.—M. W. Williams and others will install a telephone system here. P.

CORSICA, S. D.—The Farmers' Telephone Company has decided to construct another line. C.

HINTZ, WIS.—The Lazy Brook Telephone Company has been incorporated with a capital stock of $6,000.

GRIDLEY, CAL.—The Home Telephone Company has applied for the right to install its system in this city. A.

MAYWOOD, NEB.—The Farmers Telephone Company has been incorporated with a capital stock of $5,000.

CORTLAND, NEB.—The Cortland Telephone Company is planning to build a central office at a cost of $1,200.

ELMA, WASH.—The Pacific States Telephone & Telegraph Company will construct a local line to McCleary. C.

BUCKEYE, IOWA.—The Farmers Elevator Company is building a telephone line in the southern part of town. C.

DEADWOOD, S. D.—The Nebraska Telephone Company has commenced the construction of a telephone line to Sturgis. C.

ISABEL, S. D.—The South Dakota Independent Telephone Company has been incorporated with a capital stock of $100,000.

NEENAH, WIS.—The Wisconsin Telephone Company will expend $825,000 in improvements to be made to its plants here and at Menasha. C.

SEGUIN, TEX.—The Southwestern Telephone & Telegraph Company is making extensive improvements both in exchange and lines.

BYRON, OKLA.—The Byron & Mendon Telephone Company has been incorporated for $640 by S. C. Razey, Emery Wilsor and others.

POINDEXTER, N. C.—The Poindexter Telephone Company has been organized at this town with $3,200 capital, by O. J. Martin, of Siloam, and others. L.

MERRILL, WIS.—Telephone lines, aggregating seventy-five miles of wire, will be built in the town of Pine River and elsewhere in Lincoln County this coming season. C.

LEWISTON, MONT.—The Great Divide Telephone Company has incorporated with a capital of $2,500. The incorporators are W. A. Allen, W. P. Kizer and H. James.

MONROE, OKLA.—The Monroe Telephone Company has been incorporated with a capital stock of $1,000. C. E. Rogan, J. H. Banning and others are the incorporators.

MUSTANG, OKLA.—The Mustang Telephone Company has been incorporated for $1,500 by C. H. Mahr, R. L. Brownlee and others. The company will build rural lines.

NEW PARIS, IND.—The New Paris Mutual Telephone Company is completing a new exchange building in which it is proposed to install considerable new equipment. S.

SMITHVILLE, ARK.—The Farmers Mutual Telephone Company has been organized with L. N. Donahue, president; Henry Black, secretary, and Chas. Batcher, treasurer.

LANESBORO, MINN.—Farmers have organized a corporation with M. W. Williams, president, and A. J. Hanson, secretary, for the purpose of constructing a telephone exchange. C.

LIBERTY, TENN.—The Liberty Home Telephone Company has been incorporated with a capital of $3,000. The incorporators are H. M. Evans, N. H. Craddock, T. H. Chapman.

CHICO, CAL.—John Leeper announces that the Home Telephone Company will install its system in this city in competition with the Bell lines. Mr. Leeper will assume the management of the Chico service. A.

STILLWATER, OKLA.—The Pioneer Telephone Company has moved into its new quarters and the new system of telephones which it has been installing for several months past are now in use.

MERCED, CAL.—E. D. Thomas has been granted a franchise for a telephone service in this city and county. He announces that he will commence work at once, on the installation of a large plant. A.

HENRY, TENN.—The stockholders of the old Henry Telephone Company have organized a new company with G. G. Baker as president. The Company will make extensive improvements on its lines.

VIRDEN, ILL.—The Virden Telephone Company has been incorporated with capital stock of $25,000 to do a general telephone business. The incorporators are Charles H. Snell, Nellie Snell and U. G. Tucker. Z.

EPPING, N. D.—The Epping Telephone Company of Williams County has incorporated with a capital of $25,000. The incorporators are Ole. Ellingson; C. F. Carpenter, Chas. O. Odell, R. L. Hambleton, John Hannegrefs, all of Epping.

BRITTON, OKLA.—The Britton Telephone, Telegraph & Electric Company has been incorporated with a capital of $3,000. The incorporators are W. C. McGraw, W. H. Dye, G. E. Crawford and S. S. Shintaffer.

MARSHALL, IND.—The Byron Telephone Company has incorporated to build and equip a telephone system in Byron and throughout Parke County. H. I. Demarree, Courtney Morgan and Thomas M. Garland are directors. S.

BRISTOW, IOWA.—The West Point Mutual Telephone Company, of Bristow, has been incorporated with a capital of $20,000. Officers of the concern are: J. W. Piper, president; J. H. Richardson, treasurer, and J. C. Jungkunz, secretary.

EL PASO, TEX.—The Texas Telegraph Company, El Paso, has changed its name to the Mackay Telegraph & Cable Company. The place of business has been changed from El Paso to Austin and the capital stock increased from $3,000 to $25,000.

ROCK FALLS, WIS.—At a meeting of a hundred or more Rock Falls farmers preliminary steps toward the organization of a telephone company were taken. An exchange at Rock Falls, to be connected with the Eau Claire exchange, was planned.

DULUTH, MINN.—The Zenith Telephone Company is planning the erection of a modern exchange, equipped with switchboards capable of handling 10,000 telephones, in West Duluth. The cost of building and the apparatus will be from $25,000 to $30,000. C.

FRANKFORT, MICH.—Contracts have been let for three shore telegraph stations on Lake Michigan which are to be equipped with wireless apparatus for the dispatch of messages across the lake. The three stations will be at Frankfort, Manistique and Manitowoc, Wis.

WELLINGTON, KANS.—A force of men has started the reconstruction of the toll lines for the Missouri and Kansas Telephone Company between Wellington and the Oklahoma state line. It will mean a new equipment between this town, Rome, South Haven and Hunnewell.

ROCK ISLAND, ILL.—The Tri-City Independent Home Telephone Company has been incorporated with a capital stock of $1,000 to do a general telephone and telegraph business. The incorporators are Benjamin D. Farrar, J. Hays Britton and S. R. Kentworthy. Z.

WADENA, MINN.—The Compton Rural Telephone Company held the annual meeting in Compton, and it was decided to bring a second line of the system into Wadena. John Busche is president, James Anderson, vice-president, and T. J. Miland, secretary and treasurer.

TULSA, OKLA.—The Pioneer Telephone & Telegraph Company has just completed a new five-story building and has started work installing the new switchboard and power plant which when complete will be the second largest in the state. The same company is also installing a board at Hobart.

IRELAND, W. VA.—The Kanawha District Telephone Company has incorporated to build and operate telephone lines in Lewis and Braxton Counties. The incorporators are F. B. Emit, P. H. Crawford, O. B. Westfall, of Ireland; Lee Bull, John F. Bull, G. L. Cunningham, of Letch, W. Va.; J. F. Boseley, of Falls Mill.

DEADWOOD, S. D.—The Nebraska Telephone Company will spend more than $100,000 this year in improvements in the Black Hills. The largest improvements are to be made in and around Rapid City, where a new office outfit is to be installed with a modern exchange. Throughout the hills copper circuits are to be put in.

SEMINARY, TENN.—An independent telephone company has been organized and work on the construction of the company's poles and office outfit has already begun. This company is composed principally of farmers, and will connect with the independent companies of this place, Atwood, McKenzie, Bradford, Gleason, Trenton, Hickman, Ky., and other places in this section of the state.

MISHAWAKA, IND.—At a regular meeting of the council of Mishawaka an ordinance was adopted appropriating $1,180 for a police-alarm system. The mayor was authorized to enter into contract with the Signalphone Alarm Company, of Milwaukee, for a police-alarm system as per specifications offered. The Mishawaka electrical department will string the overhead wires from the ten boxes to police headquarters.

MEXICO CITY, MEX.—The Federal Government has entered into a novel contract with the Ericsson Telephone Company of this city for the construction of a long-distance telephone line between here and the city of Puebla, 160 miles. The proposed line will connect with the local system of the Ericsson Telephone Company and with the telephone system of Juan Lavin in Puebla. It is provided in the contract that the Government shall furnish the wire and other construction material and that the proceeds from the operation of the line shall be divided between the Government, the Ericsson Telephone Company and Mr. Lavin. It is stated that the construction of the line will soon be started. It will be an important addition to the telephone facilities of this part of Mexico. The Ericsson Telephone Company has under consideration the construction of other long distance lines in the states of Puebla and Vera Cruz. D.

ELECTRICAL SECURITIES.

In spite of the announcement that an extra session of Congress was inevitable the prices of stocks in general were higher at the end of the week than at the beginning. Money is much easier than usual, both at home and abroad and although the bank clearings were slightly low for the month of January this was attributed to the fact that there was less speculation than usual. On the New York stock exchange the dealings for January and February were only one half as large as they were a year ago.

The Mexican Northern River Company will shortly issue $1,000,000 five-per-cent first-mortgage bonds, to provide for additional construction work.

Application has been made to the New York Stock Exchange to list $45,740,000 of Interborough-Metropolitan preferred stock voting trust certificates.

The Northern Ohio Traction Company has sold $1,000,000 of its new preferred stock to W. E. Hutton & Company of New York, subject to the approval of stockholders at a special meeting to be held April 15.

The Massachusetts Railroad Commission has approved an issue of $666,000 fifty-year four per cent bonds of the Boston & Northern Street Railway Company. The company asked for authority to issue $700,000 bonds.

The Rio de Janeiro Tramway, Light, Heat & Power Company has disposed of $3,000,000 five per cent second mortgage bonds to Baring Brothers and J. S. Morgan & Company, of London, Eng. The company has considerable new construction work under way, and the proceeds of the sale will be used to carry out the work during the next year, as well as to pay off outstanding obligations to the banks.

The Consolidated Gas, Electric Light & Power Company, of Baltimore, has decided to increase the common stock from $6,300,034 to $8,500,000. A permanent cancellation and retirement of the entire prior lien stock, amounting to $700,000, has also been authorized.

It is understood that the stock will be offered at par, and that the shares already have been underwritten at that price less a commission.

DIVIDENDS.

Mackay Companies, preferred dividend of one per cent, and common of one and one-quarter per cent, both of which are payable March 1.

South Side Elevated Railroad Company (Chicago); a quarterly dividend of five-eighths of one per cent, payable March 31 to stock of record March 20, an increase of one-eighth of one per cent quarterly.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

	Mar. 6.	Feb. 27
Allis-Chalmers common	7⅜	8¼
Allis-Chalmers preferred	30	30⅝
Amalgamated Copper	62	63¼
American Tel & Cable	*82	*82
American Tel. & Tel.	144¾	144⅝
Brooklyn Rapid Transit	77	77½
General Electric	147	152½
Interborough-Metropolitan common	18¼	18⅝
Interborough-Metropolitan preferred	51	52¼
Kings County Electric	123	123
Mackay Companies (Postal Telegraph and Cables) common.	91¾	91¾
Mackay Companies (Postal Telegraph and Cables) preferred.	76	75⅞
Manhattan Elevated	138	138
Metropolitan Street Railway	*18	*18
Pacific Tel. & Tel.	51⅞	49½
New York & New Jersey Telephone	103	103
U. S. Steel common	75¼	77½
U. S. Steel preferred	118	118⅝
Western Union	72	73⅜
Westinghouse common	67½	69
Westinghouse preferred	118½	118

*Last price quoted.

BOSTON.

	Mar. 6.	Feb. 27
American Tel. & Tel.	144½	144⅝
Edison Elec. Illuminating	289	288
General Electric	147	152
Massachusetts Electric common	17	16¾
Massachusetts Electric preferred	87	86½
New England Telephone	142	140
Western Tel. & Tel. common	20	20
Western Tel. & Tel. preferred	94½	93

PHILADELPHIA.

	Mar. 6.	Feb. 27
American Railways	43¾	44⅞
Electric Company of America	12	12¾
Electric Storage Battery, common	53½	54
Electric Storage Battery, preferred	53½	54
Philadelphia Electric	16⅛	16⅛
Philadelphia Rapid Transit	20	20
Philadelphia Traction	85	85¼
Union Traction	47¾	47⅞

CHICAGO.

	Mar. 6.	Feb. 27
Chicago Railways, Series 1	90	
Chicago Railways, Series 2	24½	90
Chicago Subway	5	24
Chicago Telephone	121	120
Commonwealth Edison	117¾	115
Metropolitan Elevated common	21	20
Metropolitan Elevated preferred	67	65

PERSONAL MENTION.

BION J. ARNOLD of Chicago will supervise the rehabilitation of the street car system of Providence, R. I.

WILLIAM G. McADOO sailed for England on board the *Lusitania*, March 1. He left New York to secure a needed rest from business cares.

M. E. McCASKEY has resigned as vice-president and general manager of the Mahoning & Shenango Railway & Light Company, of Pennsylvania.

D. McFARLAN MOORE gave an illustrated lecture to the members of the student course of the Harrison works of the General Electric Company on Thursday, March 9.

FREDERICK A. FARRAR has been made a director and senior vice-president of the Electric Bond & Share Company, succeeding Russel Armstrong, who resigned.

W. R. SHERWOOD, formerly with the Edison Electric Illuminating Company, of Brooklyn, has taken a position in the engineering department of the Moore Light Company, of Newark, N. J.

WALTER J. GILLNER, who has been prominently connected with the Indiana Union Traction Company with headquarters in Indianapolis, has resigned to take a position with the Portland, Oregon, Railway, Light & Power Company.

E. B. MILLER is now acting as chief engineer of the Miller Engineering Company of Spokane, Wash. Mr. Miller was formerly superintendent of construction for the Panhandle Lumber Company at Ione, Wash., which position he left to take charge of the work of this newly incorporated company.

W. A. HALLER, who was with Sanderson & Porter, of New York, for a number of years, has again become associated with that company. Mr. Haller was at one time general manager of the Mobile Light & Railway Company and later became general manager and engineer of the Oklahoma Railway Company.

JOHN I. BEGGS, president and general manager of the Milwaukee Electric Railway & Light Company, and the Milwaukee Light, Heat & Traction Company, has resigned these positions and will leave Milwaukee on April 1. Mr. Beggs is to become general manager and president of the St. Louis Car Company of St. Louis, Mo.

MARQUIS EATON, of Chicago, Ill., has joined the co-partnership of the firm of Defrees, Buckingham, Ritter, Campbell & Eaton. The latter is the firm name which was adopted on February 1, the personnel of this co-partnership remaining as it has existed since January 1, 1910. The firm is now composed of Joseph H. Defrees, George T. Buckingham, Henry A. Ritter, John G. Campbell and Mr. Eaton. The latter is one of the best-known lawyers in Chicago, is a past-president of the Hamilton Club, and is the attorney for a number of large corporations, including several public utility organizations.

OBITUARY.

EDWARD P. CLARKE, secretary and treasurer of the Great Eastern Telephone Company, who also was connected with *El Commercio* died recently in New York. Only a few hours before his death Mr. Clarke had been stricken with apoplexy in the corridor of the Wall Street Journal Building, at 44 Broad Street. Mr. Clarke was fifty-nine years old.

LEGAL NOTES.

SCHMID MOTOR-FRAME PATENT.—The United States Circuit Court of Appeals for the District of New Jersey has affirmed the decision of the lower court sustaining the Schmid Patent No. 609,977 for a split-frame for a railway motor. The patent is controlled by the Westinghouse Electric & Manufacturing Company.

MARCONI WIRELESS IN ENGLAND.—The suit which was instituted in England against the British Radiotelegraph and Telephone Company, to test the validity of the Marconi patent covering wireless tuning, has been decided in favor of Marconi. The patent is equivalent to the American patent No. 763,772, issued June 28, 1904. The defense was based on prior work by Braun.

SCHLESINGER RAILWAY PATENT CASE REVERSED.—The Circuit Court of Appeals for the Third District has handed down a decision reversing the lower court in the case of the Schlesinger basic patent on the operation of electric railways in multiple sections. As noted in these columns on August 13, 1910, the United States Circuit Court upheld the patent, which is now owned by the Allis-Chalmers Company.

ELECTRIC SUPPLY COMPANY ENJOINED.—United States Judge Coxe of New York issued an injunction on February 24 against the Independent Electrical Supply Company of New York, restraining that concern from handling or disposing of a line of switch boxes manufactured by the Economy Switch Box Manufacturing Company of Cleveland, O. These boxes contained knockout plugs which it was claimed infringed the Bossert Company's patent No. 571,279, which was sustained by the Circuit Court of Appeals in June, 1910.

LIABILITY OF MOTORMEN.—The Indiana Appellate Court has held that the Terre Haute, Indianapolis & Eastern Traction Company is not liable in damages for the death of a person who

deliberately attempted to cross in front of a train when it could have been seen approaching at a distance. The court held that a motorman had the right to expect that the person seeking to drive across the track would exercise proper caution. The failure of the motorman to check the speed of the car was not contributary negligence. This applies where the interurban is operated over a private right of way. S.

NEW PUBLICATIONS.

AMERICAN SOCIETY FOR TESTING MATERIALS.—The Proceedings of the thirteenth annual meeting, held at Atlantic City last June, has been issued by the secretary. The few papers of electrical interest were abstracted in our columns at the time of the meeting.

SEATTLE-EVERETT RAILWAY.—This bulletin recently published by Stone & Webster Engineering Corporation, Boston, Mass., is exceedingly well prepared and contains a number of inserted illustrations. The line described runs between Seattle and Everett, Wash., and was first described in the *Electric Railway Journal*. The present bulletin is a reprint of the original article.

PUBLIC WORKS OF VENEZUELA.—The Venezuelan Ministry of Public Works has begun the publication of a yearly review, of which the first issue has already appeared. It contains official reports and announcements and scientific and technical papers. An illustrated description of the hydroelectric plant of the company which supplies Caracas with electric current is included.

RAILWAY ASSOCIATION PROCEEDINGS.—The proceedings of the American Electric Railway Engineering Association have been published in two bound volumes. All papers read before the 1910 convention are included in the engineering reports, these being illustrated with numerous half-tone engravings and diagrams. The second volume deals with the transportation and traffic associations.

WORKMEN'S INSURANCE IN EUROPE.—The remarkable progress made in recent years by foreign countries on the subject of employers' liability and workmen's compensation is brought out by the first of two volumes comprising the Twenty-fourth Annual Report, just issued by the United States Bureau of Labor, Department of Commerce and Labor, entitled "Workmen's Insurance and Compensation Systems in Europe." This volume treats of Austria, Belgium, Denmark, France and Germany. Volume II, now in the hands of the printer, relates to Great Britain, Italy, Norway, Russia, Spain and Sweden. Although systems of insurance and compensation for cases of industrial accidents are the best known forms of workmen's insurance, the report shows that many European countries also possess a wide variety of insurance institutions for the relief of distress caused by sickness, invalidity, old age and unemployment. Besides these forms, the methods of providing maternity benefits for wage-earning women and the systems of pensions for widows and orphans of wage earners are described.

PROPOSALS.

POWER PLANT, WEBSTER CITY, IOWA.—The City Council will receive bids until March 21 for the construction of an electric light plant. Particulars may be obtained from the city clerk of Webster City.

POST OFFICE, PLATTSMOUTH, NEB.—The office of the Supervising Architect, Washington, D. C., will receive bids until March 20, for a conduit and wiring system in the United States post office at Plattsmouth, Neb., in accordance with drawings and specifications, copies of which may be had at the office of the superintendent at Plattsmouth, or at the Supervising Architect's office.

POST OFFICE, IONIA, MICH.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until March 31, for the construction, complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Ionia, Mich., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Ionia, or at the Supervising Architect's office.

POST OFFICE, BRAZIL, IND.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until April 14 for the construction, complete (including plumbing, gaspiping, heating apparatus, electric conduits and wiring), of the United States post office at Brazil, Ind., in accordance with the drawings and specifications, copies of which may be obtained from the custodian of site at Brazil, or at the Supervising Architect's office.

POST OFFICE, ALLIANCE, O.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until March 30, for the construction, complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Alliance, O., in accordance with the drawings and specifiation, copies of which may be obtained from the custodian of site at Alliance, or at the Supervising Architect's office.

POST OFFICE, CONNELLSVILLE, PA.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until April 10 for the construction, complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Connellsville, Pa., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Connellsville, or at the Supervising Architect's office.

NEW INCORPORATIONS.

CLEVELAND, O.—The Star Electric Company has been incorporated with a capital stock of $10,000 to run a generating station. The incorporators are D. H. Tilden, A. A. McCasher, Margery Ferrell, J. M. Brug and Elmer G. Dean.

CANTON, OHIO.—The Wilson Electric Co., has been incorporated with a capital of $10,000 for the purpose of carrying on electric construction. The incorporators are J. B. Wilson, Colin C. Welshymes, Elden C. Wilson and A. C. Willis.

DAYTON, O.—The National Electric Display Company has been incorporated with a capital of $10,000 to make and deal in electric advertising signs and display devices. The incorporators are: E. P. Ridgeway, H. P. Williamson, F. P. Chamberlain, M. Le May and M. E. State.

BROOKLYN, N. Y.—The Magnetic Transmission Company has incorporated for the purpose of doing all kinds of mechanical and electrical work. The capital is $100,000 and the incorporators are: C. E. Codd, Brooklyn; C. F. Elliot, New Brighton; C. C. Henry, New York, N. Y.

ELKHART, IND.—The Briggs Manufacturing Company has been incorporated under the laws of Maine with a capitalization of $175,000 common stock, and $25,000 preferred stock, to manufacture electrical apparatus and supplies. G. A. Briggs of Elkhart, and Charles L. Andrews, R. S. Buzzell and M. M. Farrar of Augusta, Me., are the incorporators. The manufacture of the magnetos will be continued at Elkhart. Z.

INDUSTRIAL ITEMS.

THE McROY CLAY WORKS, Brazil, Ind., has mailed its February calendar and blotter to the trade.

THE ISOLATED PLANT PUBLISHING COMPANY, New York, N. Y., is moving to larger quarters in order to increase its efficiency. All communications should be addressed to 366 Fifth Avenue, New York.

THE AMERICAN CONDUIT MANUFACTURING COMPANY, Pittsburg, Pa., has mailed a booklet describing Galvanite conduit. A sample of the conduit is shown in a half-tone engraving that prefaces the booklet.

THE J. W. MORRISON LUMBER COMPANY, Minneapolis, Minn., has for immediate shipment 2,000 dry white cedar ties, five-inch face, five inches thick and eight feet long. The company also has a large stock of new poles for early delivery.

THE NATIONAL ACME MANUFACTURING COMPANY, Cleveland, O., is mailing samples of a screw on which are cut two threads of different pitch and sizes. The four operations through which this piece went are shown by a set of half-tone engravings printed on a mailing slip.

THE FORT WAYNE ELECTRIC WORKS, Fort Wayne, Ind., is sending, with its compliments, an attractive booklet of views of Fort Wayne, under the title, "Indiana's Busiest, Happiest City." A full-page illustration of the Fort Wayne Electric Works gives some idea of the size of the company's plant.

ALLIS-CHALMERS COMPANY, Milwaukee, Wis., describes in Bulletin No. 1445 its line of electric hoists. These are supplied in various types and are furnished with several styles of controller. Illustrations of the hoists assembled and in part are given together with several drawings and specification lists.

THE STANDARD PAINT COMPANY, New York, announces that owing to the greatly increased demand for its products it has been found necessary to remove the Chicago office to larger and more commodious quarters. The offices are now located in the People's Gas Building at 150 Michigan Avenue.

THE L. S. BRANCH SUPPLY COMPANY, New York, N. Y., describes the Branch non-air-gap lightning arresters in Catalog No. 2, which has recently been mailed. The enclosed and open types of arrester which are described have been adopted by the principal railroads for signal, telegraph, telephone and selective call circuits.

THE LINDSLEY BROTHERS COMPANY, Chicago, Ill., announces the removal of its eastern sales office from the Monadnock Building to the fourteenth floor of the Fisher Building. R. L. Andres, eastern representative of the Craig Mountain Lumber Company of Winchester, Idaho, of which C. P. Lindsley, president of the Lindsley Brothers Company, is president and general manager, has taken offices in the same suite.

THE HUNTER FAN & MOTOR COMPANY has opened general sales offices at 114 Liberty Street, New York City. Arthur Organ, who for a number of years has been eastern manager of the Jandus Electric Company, with headquarters in New York City, has accepted the position of general sales manager for the Hunter Fan & Motor Company, at the above address. As Mr. Organ has had a long experience in marketing this particular line and is so well known in the trade, his success is undoubtedly assured.

THE SUNBEAM INCANDESCENT LAMP COMPANY, Chicago, Ill., treats at considerable length the proper method of figuring illumination, in a recently published bulletin. The figures are based on an installation of Mazda lamps equipped with Holophane reflectors. Adaptability, equality of light, economy and cost and

other items are treated and a number of tables are given. Several types of Mazda multiple lamps are illustrated in connection with the complete catalog which is included in the bulletin. The publication is well printed, well arranged, and contains a fund of useful information.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY of Pittsburg, Pa., has recently placed upon the market a complete line of standard insulating-material products. This includes both treated and untreated fabrics and papers, a complete line of friction tapes and rubber splicing compounds, together with the various types of insulating glues, cements and gums, all of which are used in its works at East Pittsburg, in the manufacture of standard electrical products. Attractive sample books, Nos. 804-X and 805-X, together with Folder 4181, have been issued and may be obtained from the various offices of the company.

E. C. NORTON, Escanaba, Mich., who has been engaged in the cedar business for the past fourteen years handling, principally, poles and ties and who was for ten years manager of the Kellogg Switchboard & Supply Company's cedar department at Escanaba, has recently closed a contract with the Chicago & Northwestern Railway for his entire 1911 supply of ties. Mr. Norton has on hand a carefully assorted stock of seasoned Michigan cedar poles of all lengths and is prepared to make prompt shipments. Mr. Norton has just closed a deal for nearly 5,000 acres of cedar stumpage in Northern Michigan, containing some of the best poles in this section of the country.

THE CONNECTICUT TELEPHONE & ELECTRIC COMPANY, of Meriden, Conn., has opened up a new branch in connection with the E. J. Edmond Company, 1783 Broadway, New York, where a complete line of Connecticut ignition products and shock absorbers will be kept on hand to supply the New York trade. A factory branch has also been opened at 1146 Michigan Avenue, Chicago, and a Philadelphia and Boston branch will soon be opened by the Connecticut Company. Pacific Coast trade will be taken care of by Hughson & Merton, with main office at San Francisco, and with branches at Los Angeles, Portland and Seattle. Representatives are also being appointed in London, Paris, and Berlin, Germany.

THE GENERAL ELECTRIC COMPANY has just built a large and commodious fireproof warehouse building, of modern steel and concrete construction at the corner of Greenwich and Morton Streets, in New York City. This handsome new building is more than twice the size of the present quarters, at No. 24-27 West Street, where the company's warehouse has been located for the past twenty years. This new building will be ready for occupancy about April first. There are nine floors in the new building, aggregating 90,000 square feet of floor space, providing ample space for storing the numerous electrical appliances manufactured by the General Electric Company. Steel bins and racks, of a special pattern, have been installed for the accommodation of loose stock, etc. The new warehouse, with its increased floor space and improved shipping facilities, will enable the company to carry a much larger stock to meet the demands which have grown far beyond present accommodations.

THE WESTERN ELECTRIC COMPANY, New York, N. Y., has issued bulletin No. 1016 entitled "Harmonic Selective Systems for Party Lines." The bulletin contains a description in detail of the principle of operation of harmonic systems. A number of diagrams are shown to illustrate the application of harmonic apparatus and the advantages of this system. A wiring diagram shows the extreme simplicity of the harmonic wiring in the switchboard and its advantages over other four-party keys. There are only seven contacts in the Western Electric harmonic key, whereas there are twenty in the ordinary four-party key. Harmonic party line systems for four-party, eight-party and two-party service are described in detail. A number of pages are devoted to a listing of magneto and central-battery wall and desk sets used with the harmonic-ringing system, as well as harmonic extension bells and central-office ringing apparatus, including the vibrating converter, multicycle motor generator and frequency meters.

DATES AHEAD.

Minnesota Electrical Association. Annual convention, St. Paul Hotel, St. Paul, Minn., March 14, 15 and 16.

National Electric Light Association. Annual meeting of New England Section, Edison Building, Boston, Mass., March 17.

West Virginia Independent Telephone Association. Annual convention, Waldo Hotel, Clarksburg, W. Va., March 23 and 24.

American Supply and Machinery Manufacturers' Association. Annual meeting, Louisville, Ky., April 3, 4 and 5.

American Electrochemical Society. Annual meeting, Chemists' Club Building, New York, N. Y., April 6, 7 and 8.

Missouri Electric, Gas, Street Railway and Water Works Association. Annual meeting, St. Louis, Mo., April 13, 14 and 15.

Iowa Electrical Association. Annual meeting, Davenport, Iowa, April 19, 20 and 21.

Southwestern Electrical and Gas Association. Annual convention, Houston, Tex., April 27-29.

National Electric Light Association. Annual convention, New York City, May 29 to June 3.

Mississippi Electric Association. Annual convention, Gulfport, Miss., June 20-21.

Association of Railway Electrical Engineers. La Salle Hotel, Chicago, November 6-10.

Directory of Electrical and Allied Engineering and Scientific Societies

(Published in the second issue of each month.)

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RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) February 28, 1911.

985,120. TELEPHONE INSTRUMENT. William Aitken, Liverpool, England. Filed March 1, 1909. A wall instrument has at its center a pivot for the transmitter arm so that the transmitter can be swung in a plane parallel to the front of the case.

985,127. PORTABLE TELEPHONE POLE. George J. Bayless, Oakland, Cal. Filed November 8, 1910. Has a pair of conductor arms pivotally connected with the head of the pole and adapted to be extended from opposite sides thereof, the arms being electrically insulated from each other. Circuit wires lead from the arms.

985,144. ELECTRIC OVEN. James V. Chown, Oakland, Cal., assignor to R. Porter Giles, William S. Cox, J. Clem Ady and Jessie Marian Chown, Oakland, Cal. Filed Nov. 29, 1909. Comprises thick walls filled with earth, sawdust and lime, a similar door, a lining throughout of fireclay and an electric heating element at the bottom of the oven chamber.

985,169. TELEPHONE TRANSMITTER CUT-OUT. Christopher M. Hartnett, Malden, Mass. Filed May 31, 1910. The transmitter is mounted on a metallic pillar forming one conductor of its circuit. A movable tap from the other side of the circuit is provided for short-circuiting the transmitter.

985,173. ELECTRIC SWITCH. Joseph Hildege Arthur Normandeau, Montreal, Quebec, Canada, assignor to Monarch Electric Company, Montreal, Canada. Filed June 4, 1910. A pull-switch for a lamp socket.

985,186. TELEPHONE SYSTEM. Oscar M. Leich, Genoa, Ill., assignor to Cracraft-Leich Electric Company, Genoa, Ill. Filed November 13, 1909. A party-line system has a number of bridging telephones on it and also a number connected between ground and repeating coils in both wires of the main line.

985,191. ORDER-WIRE KEY. Frank R. McBerty, New Rochelle, N. Y., assignor to Western Electric Company, Chicago, Ill. Filed September 5, 1908. Has several rows of contact springs and keys for changing the connection between the springs.

985,215. MOTOR-CONTROLLER. Arthur Simon, Milwaukee, Wis., assignor to Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed June 1, 1909. Comprises a number of automatic switches arranged to operate successively to accelerate the motor, interlocks between the switches for insuring the opening of each switch prior to the operation of the next one, and means for checking the successive operation of the switches while abnormal conditions exist in the motor.

985,226. ELECTRIC SMELTING FURNACE. Edward R. Taylor, Penn Yan, N. Y. Filed July 7, 1910. A furnace of the stack type with electrodes directly over the hearth.

985,233. PRINTING TELEGRAPH. Johann V. Vermeer, Oakland, Cal. Filed Feb. 9, 1910. Combined with a number of sending-keys is a number of corresponding printing members, a single line wire, and means including commutator segments and gravity-actuated brushes movable over them, whereby on the depression of a key a corresponding printing member is operated, the segment sections being of less number than the keys and capable of a number of permutations equal to the number of keys.

985,234. ELECTRIC-LIGHT SWITCH. Charles Wagner, New York, N. Y., assignor to Sterling Bronze Company. Filed March 9, 1910. In the base of a rotatable candle socket is a switch operated by turning the socket.

985,241. ELECTRICAL CONNECTION. Johan M. Anderson, Boston, Mass., assignor to Albert and J. M. Anderson Manufacturing Company, Boston, Mass. Filed December 19, 1910. A plug terminal having an insulating bushing within a cylindrical metallic casing.

985,246. SOCKET CAP. William McK. Black, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn. Filed December 29, 1910. Has a flanged hub-hole, a flanged hub inserted therein and a circular washer about the flange.

985,252. SOCKET CAP. Charles Doescher, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn. Filed December 29, 1910. Similar to the above, but provided with a polygonal instead of a circular washer.

985,288. SPRING FASTENING DEVICE. John Schade, Jr., New York, N. Y., assignor to Fahnestock Electric Company. Original application filed December 13, 1906. Divided and this application filed August 12, 1910. A spring-clip terminal mounted on top of the zinc shell of a dry battery.

985,344. ELECTRIC HEATER. Arthur H. Harvie and William G. Davis, Dallas, Tex., assignors to Harvie-Davis Heater Company, Phoenix, Ariz. Filed September 3, 1910. A tubular water heater has a resistance element in a casing which is surrounded by a jacket.

985,358. MEANS FOR SUPPORTING AND DRIVING SINGLE-SHAFT CENTRIFUGAL MACHINES. Edward D. Mackintosh, New York, N. Y., assignor of one-half to S. S. Hepworth Company, New York, N. Y. Filed February 8, 1904. The vertical shaft of the rotor of the motor has a sleeve with a gyration bearing which permits the motor to be flexibly mounted. The shaft carries a revolving basket at its lower end.

985,368. ELECTRIC SECONDARY BATTERY. Parnell Rabbidge, North Sydney, New South Wales, Australia. Filed September

20, 1907. An absorbent for electric cells comprises suitably washed, screened and dried copra, treated with a liquid electrolyte.

985,386. PRODUCTION OF DIVIDED METALS. Fritz Blau, Berlin, Germany, assignor to General Electric Company. Filed September 14, 1906. A process for producing finely divided tungsten consists in reducing oxygen compounds of tungsten by means of a very large excess of hydrogen at a relatively low reducing temperature.

985,387. METHOD OF MANUFACTURING METALLIC ILLUMINATING BODIES FOR ELECTRIC INCANDESCENT LAMPS. Fritz Blau, Berlin, Germany, assignor to General Electric Company. Filed September 14, 1906. An amplification of the above in which the filaments are heated in tubes to a white heat by an electric current in the presence of a strong flow of hydrogen gas through the tubes.

985,388. THIRD RAIL. Charles A. Bluhm, Michigan City, Ind. Filed June 9, 1909. The conductor rail is mounted between guard rails resting on chairs that are connected by reinforced concrete slabe to form two conduits.

985,395. LAMP-SOCKET FASTENING. Hjalmar Christensen, Seattle, Wash. Filed June 27, 1910. Has a body of pliable material, one end of which is provided with an outwardly projecting shoulder and the opposite end is formed with inwardly extending longitudinal slits providing a number of fingers.

985,399. MICA INSULATION. John L. Cooper, Wilkinsburg, and Arthur J. Sweet, Pittsburg, Pa., assignors to Westinghouse Electric & Manufacturing Company. Filed October 18, 1905. Comprises two sheets of thin paper, interposed sheet mica and a binder therefor that contains varnish, wood alcohol and castor oil.

985,400. ELECTRIC LOCOMOTIVE. William Cooper, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed July 28, 1909. Covers the side-crank drive used in the locomotives of the Pennsylvania Terminal at New York City. (See cut.)

985,413. MOTOR-CONTROLLING SYSTEM. Clark T. Henderson, Milwaukee, Wis., assignor to Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed May 20, 1907. A constant-speed generator has its armature electrically connected to the motor armature and its field separately excited through a wide range so as to vary the impressed voltage and speed of the motor without excess motor current.

985,420. WIRE COIL. Wilhelm Keller, Frankfort-on-the-Main, Germany, assignor to Hartmann & Braun Aktiengesellschaft, Frankfort-on-the-Main, Germany. Filed June 8, 1905. An instrument coil comprises a frame of soft material and insulated wire wound on the frame, the wire and frame being molded and compressed into a solid mass leaving no air spaces between the windings and the entire surface of the winding being smooth.

985,421. SNAP SWITCH. Charles J. Klein, Milwaukee, Wis., assignor to Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Continuation of application filed September 6, 1907. This application filed May 11, 1909. A reciprocating button carries a doubly conical cam upon whose inclined surfaces a spring moves bodily and actuates the switch.

985,422. INCANDESCENT LAMP. Arthur S. Knight, Newark, N. J., assignor to Westinghouse Lamp Company. Filed July 19, 1909. A tubular lamp containing a supporting anchor from the stem to the tip, where it engages a bight of the filament through a helical spring.

985,426. THERMO-ELECTRIC BATTERY. Johannes Marschall, Dresden, Germany. Filed July 10, 1908. A tubular heater has a number of thermo-electric cells, each having a flat metal sheeting with a ring part about the heater and a metal coating partly insulated from the sheeting.

985,430. SHOE FOR THIRD-RAIL ELECTRIC CARS. Louden A. McCoubrie and Charles F. Raydure, Philadelphia, Pa. Filed April 24, 1909. A removable contact shoe is flexibly mounted to its support.

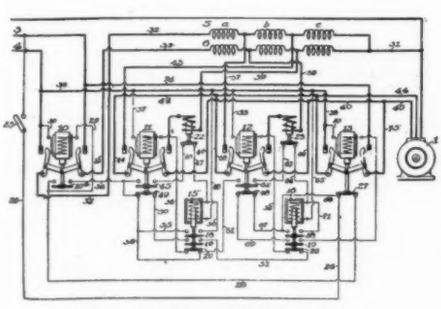
985,432. ELECTRIC-LAMP FIXTURE. Thomas Frederic Miller, St. John, New Brunswick, Canada, assignor of one-eighth to Walter Garfield Miller, St. John, Canada. Filed June 6, 1910. Comprises curved arm for supporting a street arc lamp, a worm wheel for rotating the arm, and means for automatically cutting off the circuit when the arm is turned down.

985,454. MOTOR. William W. Rosenfield, New York, N. Y. Original application filed Feb. 1, 1905. Divided and this application filed July 24, 1907. A spring motor is provided with a stop which normally holds the motor inoperative. When the spring is unwound to a certain predetermined tension, the electric motor is put in operation and the spring re-wound.

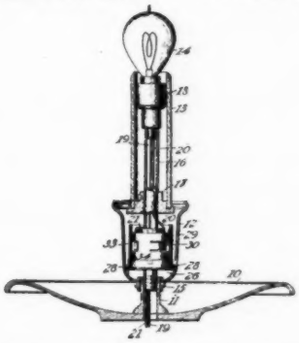
985,456. ELECTRICAL MEASURING INSTRUMENT. Maurice C. Rypinski, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa. Filed November 15, 1907. Has a T-shaped bracket which is connected with the movable coil. Two legs of the bracket embrace and are secured to the coil, and posts secured to the brackets are provided with pivot-pins and with alining surfaces seated against the remaining legs of the brackets.

985,474. ILLUMINANT FOR ELECTRICAL INCANDESCENT LAMPS. Orlando M. Thowless, Newark, N. J. Filed May 13, 1909. Makes use of the method of converting a vitrified normally non-conductive oxide glower into a conducting illuminant at ordinary temperatures which consists in reducing sufficient material within the glower to make it normally conductive.

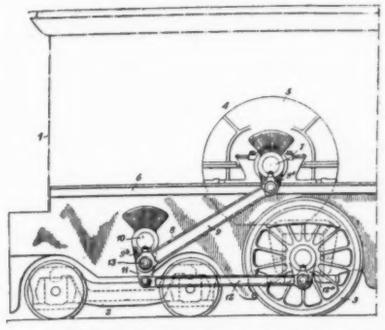
985,484. ADVERTISING DEVICE. Charles W. Whaley, Indianapolis, Ind. Filed December 20, 1909. An advertising sign is operated by two rollers, being first wound on one and then on the other. The motor working the rollers is automatically reversed by spring contacts held down by the paper rolls.



985,215.—MOTOR CONTROLLER.



985,234.—CANDLE SOCKET SWITCH



985,400.—ELECTRIC LOCOMOTIVE.

985,486. ELECTRIC-LIGHTING APPARATUS. Alfred A. Wohlauer, New York, N. Y. Filed July 16, 1907. The lamp has double tubes or bulbs, one arranged within the other, in combination with a filament contained in the inner tube or bulb, and connected to an enlarged terminal forming the anode of the vapor arc or discharge. Means are provided for starting the vapor arc or discharge in the outer tube or envelope.

985,502. APPARATUS FOR MAKING METALLIC FILAMENTS FOR INCANDESCENT ELECTRIC LAMPS. Fritz Blau, Berlin, Germany, assignor to General Electric Company. Original application filed September 14, 1906. Divided and this application filed February 17, 1908. Separate chambers are arranged so that the filaments may be heated to incandescence and then may be treated by currents of gas. Each chamber may be caused to be first in the path of the gas.

985,509. SWITCH. Charles E. Carpenter, New York, N. Y., assignor to Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed May 9, 1907. A number of switch contacts are mounted on the longitudinal core of a solenoid. Several stationary switch contacts provided with suitable resistances are put in circuit one after the other by the increasing pull of the solenoid.

985,510. CONTROLLING DEVICE. Charles E. Carpenter, New York, N. Y., assignor to the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed May 9, 1907. Automatically operated devices cause the motor to start and also cause its speed to vary in certain ways under predetermined conditions.

985,547. ELECTROMAGNETIC MASSAGE DEVICE. Edmund Hugh Pryce, New York, N. Y. Filed September 3, 1908. The vibrating element is attached to a vibratory armature, one end of which is flexibly secured to an electromagnet, the other end being flexibly secured to the opposite pole.

985,628. TRAIN-CONTROLLED HIGHWAY SIGNAL. Robert D. Peters, Knox, Ind. Filed August 6, 1909. Upon the energization of an armature in the signal the signal light is lit.

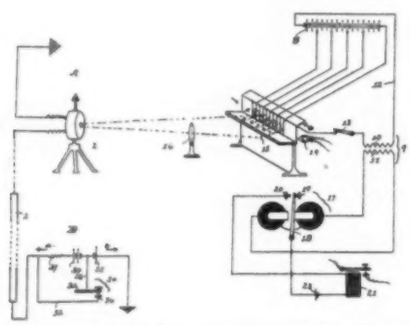
985,629. RECEPTACLE FOR ELECTRIC LAMPS. Johann G. Peterson, Hartford, Conn., assignor to Arrow Electric Company, Hartford, Conn. Filed November 10, 1910. Has an insulating base with recessed U-shaped boss, and a center contact and a terminal plate both confined in the recess of the boss, in combination with a single securing screw for holding said plate and contact in the recess.

985,654. TROLLEY STAND. Bose B. Bowers, Macon, Ga. Filed March 16, 1910. The drawbar which supports the trolley pole is operative only within certain limits, the holding dog being released when the trolley wheel leaves the wire. On release of the dog the pole drops.

985,676. ELECTROMAGNETIC DEVICE. Winthrop K. Howe, Rochester, N. Y., assignor to General Railway Signal Company, Gates, N. Y. Filed February 12, 1910. Comprises a winding, an armature actuated by it, a resilient stop engaged by the armature at the limit of its movement, and means for cushioning the return of the stop when disengaged by the armature.

985,678. SEWING-MACHINE ELECTRIC MOTOR. Francis P. Huyck, Toledo, O., assignor to Edward H. Rhoades, Jr., trustee, Toledo, O. Filed June 7, 1907. A field magnet surrounds the motor armature and a brake-shoe is interposed between the armature and field magnet and tensioned against frictional contact. Means are provided for throwing the brake-shoe into frictional engagement with the periphery of the armature.

985,680. TELEGRAPHIC RECEIVING ORGANISM. Isidor Kitsee, Philadelphia, Pa. Filed October 15, 1909. A movable member is adapted to deflect light rays and of a series of selenium cells each cell is provided with means to allow a current flow



985,760.—TELEGRAPH RECEIVING ORGANISM.

of different value when illuminated. Means are furnished to the cells for translating the movement of the movable member in a direction away from its normal zero as the beginning of a telegraphic character.

985,681. POLE PROTECTOR. Valentine Konopinski, Brooklyn, N. Y. Filed December 7, 1909. Concrete filling is packed around the base of the pole.

985,685. TROLLEY-CIRCUIT CLOSER. Gerald R. Livergood and Bertram C. Donnelly, St. Joseph, Mo. Filed May 1, 1909. A circuit closing and opening means is contained in the axle of a trolley wheel.

985,691. MACHINE FOR FILLING DRY BATTERIES. Philip P. Nungesser, Cleveland, O., assignor to Nungesser Electric Battery Company, Cleveland, O. Filed August 4, 1908. Comprises a feed hopper having a hole in its bottom, a cup holder next beneath said hopper, a plunger adapted to enter the holder through the hopper and a carbon support mounted on the holder and extending into the plunger.

985,697. DIRECT-CONNECTED ELEVATOR. Charles O. Pearson, New York, N. Y., assignor to Otis Elevator Company, New York, N. Y. Filed October 12, 1908. An internal combustion engine is connected to the hoisting apparatus. Devices driven by the engine generate a fluid pressure supply and an electrical supply. Means energized by these supplies are arranged to start and to control the speed of the engine.

985,699. ELECTRICALLY-CONTROLLED ELEVATOR. Charles O. Pearson, New York, and August Sundh, Yonkers, N. Y., assignors to Otis Elevator Company, New York, N. Y. Filed October 23, 1908. An internal-combustion engine drives generators which supply energy to storage batteries. The batteries and motors are used to start the engine in either direction.

985,700. MANUFACTURE OF ARMATURE HOUSINGS. Carl A. Pfanstiehl, Highland Park, Ill., assignor to Pfanstiehl Electrical Laboratory, North Chicago, Ill. Filed April 18, 1910. A process of forming the core used in casting the armature housing of a magneto-electric machine.

985,701. ELECTRIC SWITCH. Carl A. Pfanstiehl, Highland Park, Ill., assignor to Pfanstiehl Electrical Laboratory, North Chicago, Ill. Filed April 18, 1910. A segmental series of stationary contacts are arranged on a base on which a movable contact arm is pivoted. The lever is arranged so that it may be locked in a dormant position.

985,705. RELAY. Willis B. Rice, Rochester, N. Y., assignor to General Railway Signal Company, Gates, N. Y. Filed July 11, 1910. Combines a polyphase field, a stationary magnetic core, a rotor comprising a conductive shell surrounding the core, contact devices, and mechanism connecting the rotor with the contact devices to actuate the latter by the rotation of the rotor.

985,707. INSULATOR SUPPORT. Albert Scheible, Oak Park, Ill. Filed September 25, 1909. The support permits the insulator to rock or swing with reference to the stationary part of the support.

985,758. CONTROLLER FOR ELECTRIC MOTORS FOR SEWING MACHINES. Francis P. Huyck, Toledo, O., assignor to Edward H. Rhoades, Jr., trustee, Toledo, O. Original application filed June 7, 1907. Divided and this application filed Dec. 28, 1907. An electric motor is provided with a brake and a starting rheostat, together with means for actuating the brake and rheostat in harmony.

985,760. TELEGRAPHIC RECEIVING ORGANISM. Isidor Kitsee, Philadelphia, Pa. Original application filed December 6, 1909. Divided and this application filed January 27, 1910. A beam of light is reflected from a mirror on a set of selenium cells, the whole arrangement acting as a relay translating incoming impulses into readable characters.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Offices) that expired March 6, 1911:

515,751. ELECTRICAL SWITCH-SIGNAL. Thomas L. Dalton and Nelson W. Dalton, Sandy Hill, N. Y.
515,755. ELECTRIC MOTOR. Gano S. Dunn, New York, N. Y.
515,761. SYSTEM FOR SIGNALING AND COMMUNICATION. Thomas F. Gaynor, Louisville, Ky.
515,762. ELECTRIC SIGNAL BOX. Thomas F. Gaynor, Louisville, Ky.
515,775. APPARATUS FOR FORMING SHEDS IN LOOMS ELECTRICALLY. Joseph Kauffmann, Hanover, Germany.
515,778. ELECTRIC METAL WORKING. Hermann Lamp, Lynn, and Walter S. Moody, Chelsea, Mass.
515,797 TELEPHONE RECEIVER. Charles Selden, Baltimore, Md.
515,806. ELECTRIC-LIGHTING SYSTEM. Harvey J. Wells, Osceola Mills, Pa.
515,822. ELECTRIC CABLE. Thomas J. Dewees, Palymyra, N. J.
515,827 WATER-ALARM FOR BOILERS. Charles A. Hatch, Hartford, Conn.
515,845. TELEGRAPH REPEATER. William E. Sloan, Chicago, Ill.
515,850. ELECTRIC ARC LAMP. James J. Wood, Fort Wayne, Ind.
515,882. DYNAMO-ELECTRIC MACHINE. James E. Maynadier, Taunton, Mass.
515,885. ELECTRICAL TRANSMISSION OF POWER. Charles F. Scott, Pittsburg, Pa.
515,900. ALTERNATING-CURRENT MOTOR. Charles E. L. Brown, Baden, Switzerland.
515,939. TELEPHONE EXCHANGE SYSTEM. Edwin Pope, Quebec, Canada.
515,940. TELEPHONE SYSTEM. Edwin Pope, Quebec, Canada.
515,960. AUTOMATIC CUT-OUT FOR INCANDESCENT LAMPS. Edward H. Johnson, New York, N. Y.
515,962. ALTERNATING-CURRENT MOTOR. John F. Kelly, Pittsfield, Mass.
515,965. ELECTRIC STOP-MOTION FOR KNITTING MACHINES. Arthur A. Merritt, Cohoes, N. Y.
515,969. REGULATING SOCKET FOR ELECTRICAL APPARATUS. Elias E. Ries, Baltimore, Md.
515,970. ELECTRIC CURRENT REGULATOR. Elias E. Ries, Baltimore, Md.
515,971. PORTABLE REGULATOR FOR ELECTRIC CURRENTS. Elias E. Ries, Baltimore, Md.
515,977. ALTERNATE-CURRENT MOTOR. William Stanley, Jr., John F. Kelly and Cummings C. Chesney, Pittsfield, Mass.
516,025. ELECTRIC CIRCUIT-BREAKER. David S. Schureman, Rockford, Ill.
516,038. AUTOMATIC SWITCH FOR STORAGE-BATTERY USE. Theodore A. Willard, Norwalk, O.
516,043. THERMOSTAT. Earl Barney, Schenectady, N. Y.
516,071. ELECTRIC HEATING APPARATUS. Arthur E. Appeyard, Boston, Mass.
516,095. ELECTRIC RADIATOR. Samuel B. Jenkins, Boston, Mass.
516,152. ELECTRICAL HEATER. Adam Cochrane, Lowell, Mass.
516,161. ELECTRIC CABLE JOINT. Thomas C. Loe, New York, N. Y.
516,167. APPARATUS FOR GENERATING STEAM BY ELECTRICITY. Herbert E. Rider and Joseph H. Lewis, New York, N. Y.
516,170. ARMATURE FOR DYNAMO-ELECTRIC MACHINES. Montgomery Waddell and Justus B. Entz, Bridgeport, Conn.